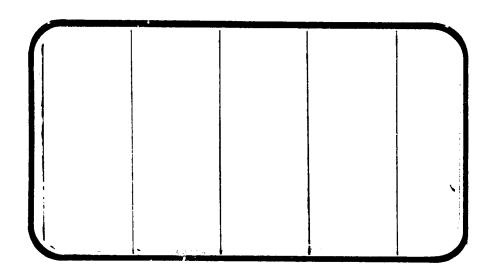


NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA CR-



(NASA-CR-141803) AN INVESTIGATION IN THE NASA MSFC 14-INCH TRISONIC WIND TUNNEL TO DETERMINE THE PRESSURE DISTRIBUTION OVER THE COMPONENTS OF A 0.004 SCALE VERSION OF THE BOCKWELL MCR 0074 BASELINE SHOTTLE ASCENT

N70-11224

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SPACE SHUTTLE

AERCTHERMODYNAMIC DATA REPORT



JOHNSON SPACE CENTER

HOUSTON, TEXAS

DATA DANagement services

SPACE DIVISION CHRYSLER

DMS-DR-2027 NASA-CR-141,808 VOLUME 2 OF 3

AN INVESTIGATION IN THE NASA MSFC 14-INCH TRISONIC WIND TUNNEL TO DETERMINE THE PRESSURE DISTRIBUTION OVER THE COMPONENTS OF A 0.004 SCALE VERSION OF THE ROCKWELL MCR 0074 BASELINE SHUTTLE ASCENT CONFICURATION (IA32F)

bу

Paul E. Ramsey, NASA/MSFC

Prepared under NASA Contract Number NAS9-13247

bу

Data Management Services Chrysler Corporation Space Division New Orleans, La. 70189

for

Engineering Analysis Division

Johnson Space Center
National Aeronautics and Space Administration
Houston, Texas

WIND TUNNEL TEST SPECIFICS:

Test Number;

MSFC TWT 567

NASA Series No.:

IA32F

Occupancy Hours:

151

Date:

May 10-24, 1973

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AN INVESTIGATION IN THE NASA MSFC 14-INCH
TRISONIC WIND TUNNEL TO DETERMINE THE PRESSURE
DISTRIBUTION OVER THE COMPONENTS OF A 0.004 SCALE
VERSION OF THE ROCKWELL MCR 0074 BASELINE SHUTTLE
ASCENT CONFIGURATION (IA32F)

bу

Paul E. Ramsey, NASA/MSFC

ABSTRACT

An aerodynamic investigation was conducted in the MSFC 14x14-inch Trisonic Wind Tunnel to determine the pressure distribution over the components of a .004 scale version of the Rockwell International MCR 9074 baseline Shuttle ascent configuration. Data were obtained for Mach numbers from 0.6 to 3.48, angles of attack from -10 to 10 degrees, and angles of sideslip from -10 to 10 degrees at zero angle of attack. Also, -4 and 4 degrees sideslip were run for an angle of attack of -5 and 5 degrees. The baseline geometric parameters were Orbiter/ET incidence of 0.5 degree, separation distance at aft tie point 0.14 inch, baseline SRM location $(\phi_s = 90^{\circ}, X_s = 0)$, and ET ogive nose without retro rocket package. Control deflections were excluded from investigation. Data are presented in terms of pressure coefficient, CP, as a function of longitudinal distance, X/L, at constant circumferential position, ϕ , and ϕ at constant X/L. Because of the large volume of data obtained, only typical plots are in this report. Volume 1 contains plotted ET pressure data; Volume 2 contains plotted SRM pressure data; and Volume 3 contains the appendix -- the complete set of tabulated source data.

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	PHI BETA MACH	(2)	1135-1188

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(Concluded)	
FIGURES	
OF DATA	-
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INDEX OF DATA FIGURES (Concluded)	RES (Concluded)	PLOTTED	
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PLOTTED COEFF CIENTS SCHEDULE

CP versus X/LT CP versus PHI CP versus X/LS €£0

NOMENCLATURE

SYMBOL	PLOT SYMBOL	DEFINITION
$\Lambda_{\mathbf{b}}$		base area, in?
b _{ref}	BREF	lateral reference length, in.
c		theoretical chord length, in.
Cp	CP CONFIG	pressure coefficient, $Pl - P\infty$ configuration code q
io	ORBINC	orbiter incidence angle relative to external tank, positive when tail down, deg.
^l ref ls	LREF LS	longitudinal reference length, in. length of SRM, in.
2 _t	LT	length of external tank, in.
M _∞	MACH	freestream Mach number
P£		local pressure measured on the test model, psi
P∞	PSA	freestream static pressure, psi
PT	PTA	freestream total pressure, psi
q	Q	dynamic pressure, psi
RN/2	RL	Reynolds number per unit length; million/ft
Sref	SREF	reference area, in?
T X		temperature, °F longitudinal displacement along centerline measured from body nose, in.
X/c	x/c	longitudinal distance from theoretical wing leading edge ratioed to the theoretical chord
x/£ _s	X/LS	longitudinal location measured from SRM nose ratioed to length of SRM

NOMENCLATURE (continued)

	PLOT	
SYMBOL	SYMBOL	DEFINITION
X/%t	X/LT	longitudinal location measured from external tank nose ratioed to length of external tank
x _{c.g.}	XMRP X-SRM	longitudinal moment reference point, in longitudinal location of SRM on external tank, zero for baseline, in
Y Y _{C.G.}	YMRP	lateral displacement from centerline lateral moment reference point, in
2	DELTAZ	separation distance between external tank top and orbiter bottom, measured at the aft tie point, in
z _{c.g.}	ZMRP	vertical moment reference point, in
α	ALPHA	angle of attack, deg.
В	BETA	angle of sideslip, deg.
r	DIHDRL	dihedral angle, deg.
δa	AILRON	aileron deflection angle, deg.
δ _e	ELEVTR	elevator deflection angle, deg.
$\delta_{f r}$	RUDDER	rudder deflection angle, deg.
η		spanwise location measured from orbiter body centerline ratioed to half span
ф	PHI	circumferential location of pressure orifice, deg.
$^{\phi}\mathbf{s}$		circumferential location of SRM relative to top of external tank, deg.
ET		external tank
SRM or SRB		these two terms are used interchangeably to mean solid rocket booster

NOMENCLATURE (Concluded)

SUBSCRIPTS	DEFINITION
л	alleron
h	base
c.c.	center of gravity
. e	elevator
£.	local
0	orbiter
r	rudder
s	solid rocket motor
T	total conditions
t	external tank
w	wing
x	pressure orifice number, 1, 2, etc.
œ	free stream conditions
ref	reference conditions

CONFIGURATIONS INVESTIGATED

The launch configuration consisted of the double delta wing orbiter with one large external hydrogen-oxygen tank (ET) and two solid rocket boosters (SRM) mounted on the ET beneath the orbiter wing (see Figure 1). Configuration component nomenclature was as follows:

O₃ (B₁₀ C₅ D₇ F₄ M₃ W₈₇ E₁₈ V₅ R₅) Rockwell MCR 0074 baselike to siter

Tg 324-inch diameter baseline exter

nal tank with ogive the community

S3/2 142-inch do solid rocket motor

(one) with 18° nose cone.

U₅ Aft orbiter and SRM attach

structure.

The combinations of components were defined relative to the component on which the data were obtained as follows:

COMPONENTS

DESCRIPTION

Orbiter Data

 $(0_3)/(T_9)/(S_{3/2})/(S_{3/2})$ Orbiter in presence of ET and two

SRM's.

 $(0_3)/(T_9)(U_5)/(S_{3/2})/(S_{3/2})$ Orbiter in presence of ET, two SRM's

and attach structure.

External Tank Data

 $(T_9)/(S_{3/2})/(S_{3/2})/(O_3)$ ET in presence of two SRM's and

orbiter.

 $(T_9)(U_5)/(S_{3/2})/(S_{3/2})/(O_3)$ ET in presence of two SRM's, orbiter,

and attach structure.

COMPONENTS

DESCRIPTION

SRB Data

 $(s_{3/2})/(o_3)/(T_9)/(s_{3/2})$

SRM in presence of ET, one SRM, and

orbiter.

 $(s_{3/2})/(o_3)/(T_9)(U_5)/(s_{3/2})$

SRM in presence of ET, one SRM,

orbiter, and attach structure.

Details of the individual components are given in Table III entitled Model Dimensional Data.

TEST FACILITY DESCRIPTION

The Marshall Space Flight Center 14" x 14" Trisonic Wind Tunnel is an intermittent blowdown tunnel which operates by high pressure air flowing from storage to either vacuum or atmospheric conditions. A Mach number range from .2 to 5.85 is covered by utilizing two interchangeable test sections. The transonic section permits testing at Mach 0.20 through 2.50, and the supersonic section permits testing at Mach 2.74 through 5.85. Mach numbers between .2 and .9 are obtained by using a controllable diffuser. The range from .95 to 1.3 is achieved through the use of plenum suction and perforated walls. Mach numbers of 1.46, 1.96, and 2.50 are produced by interchangeable sets of fixed contour nozzle blocks. Above Mach 2.50 a set of fixed contour nozzle blocks are tilted and translated automatically to produce any desired Mach number in .25 increments.

Air is supplied to a 6000 cubic foot storage tank at approximately -40°F dew point and 500 psi. The compressor is a three-stage reciprocating unit driven by a 1500 hp motor.

The tunnel flow is established and controlled with a servo-actuated gate valve. The controlled air flows through the valve diffuser into the stilling chamber and heat exchanger where the air temperature can be controlled from ambient to approximately 180°F. The air then passes through the test section which contains the nozzle blocks and test region.

Downstream of the test section is a hydraulically controlled pitch sector that provides a total angle of attack range of 20° ($\pm 10^{\circ}$). Sting offsets are available for obtaining various maximum angles of attack up to 25° .

The diffuser section has movable floor and ceiling panels which are the primary means of controlling the subsonic Mach numbers and permit more efficient running supersonically. The sector assembly and supersonic diffuser telescope into the subsonic diffuser to allow easy access to the model and test section.

Tunnel flow is exhausted through an acoustically damped tower to atmosphere or into the vacuum field of 42,000 cubic feet. The vacuum tanks are evacuated by vacuum pumps driven by a total of 500 hp.

Data are recorded by a solid-state digital data acquisition system.

The digital data are transferred to punched cards during the run to be reduced later by a computer to proper coefficient form.

MODEL DESCRIPTION

The model was 0.004 scale and was comprised of three basic geometric components: (1) the external fuel tank; (2) two solid rocket motors (SRM's); and (3) the orbiter configuration. The orbiter and SRM's were fastened to the external tank, which was sting supported. The orbiter and SRM's were fixed with respect to the ET in the axial and radial locations depicted in Figure 1. Only the baseline configuration was tested; i.e., orbiter incidence was 0.5°, orbiter/ET separation at the aft point was 0.14 inch, SRB radial location was 90°, and SRM longitudinal position was 1.732" aft of ET nose. No control surfaces were deflected during this test.

The orbiter consisted of a stainless steel body obtained from the Rockwell force model which was fitted with a pressure instrumented aluminum wing. This wing contained 40 pressure taps, 19 on the top surface of the left wing, 19 on the bottom surface of the right wing, and 2 on the left wing leading edge. The location of each orbiter pressure orifice and the numbering system are presented in Figure 2. The 0.032-inch 0.D., annealed stainless steel pressure tubing was routed out the base of the model and along the exterior of the ET sting.

The SRM's and ET were constructed of stainless steel and contained 222 orifices (111 each) and 195 orifices, respectively. Stainless steel, annealed, 0.032-inch O.D. pressure tubing was routed out the base of the SRM's on the outside of the ET sting while the ET tubing was routed out

through the sting. Tubing of 0.050" O.D. was brazed onto the 0.032-inch 0.D. tubing as close to the models as possible and routed down the sector, through the tunnel floor, and out the side of the tunnel. At this point, tygon tubing was used to connect the steel tubing to ten 48 port scanivalve heads.

The pressure tap locations on each model component are shown in Figures 2-4. The launch vehicle SRM's and external tank were manufactured at MSFC (Model #450 Assembly) per MSFC drawings 80M51305, 80M51311, 80M51312, and 80M51313. The orbiter was manufactured at Lockheed-Huntsville. The MCR 0074 baseline configuration was defined by Rockwell International drawings VL70-000089B, VL77-000012, VL72-000061B, and VL78-000018.

Instrumentation:

The model instrumentation consisted of strain gages located on the sting for measuring sting deflections and the transducers required for the 457 pressure measurements.

The wing pressure taps were numbered chordwise on the top of the left wing, starting at the front at the inboard chord location and moving toward the wing tip. The right wing was numbered similarily except on the bottom of the wing. This is shown in Figure 2.

Since the ET is symmetrical, only the left side was instrumented with pressure taps. These were numbered axially from front to back at each circumferential location, beginning with A and proceeding through K.

The SRM's were numbered similarily except that half of the pressure instrumentation was located on the left SRM and the remainder on the right. This setup was required to obtain a distribution completely around the SRM because of the assymmetrical pressure distributions caused by the presence of the ET and the physical limitations of getting all the required tubing in one SRM. Hence, the orifice axial rows are numbered A through H on the left SRM and then picked up on the right SRM with I through P as if continued on the left SRM.

Test Procedures:

The ET was supported on an integral straight sting which was mounted in a 5-degree offset. This offset was rolled to \pm 90° to obtain polars at constant -5° or 5° angle of attack. To obtain the pitch polars of \pm 10°, a short "dogleg" sting was used behind the 5° offset to provide zero sting offset. This procedure allowed changing the sting offset easily without disconnecting the model pressure tubing. The sting and model setup is shown in Figure 5.

It should be noted that force data obtained during MSFC TWT 570 (Ref. 4) indicates a substantial ET sting effect on the SRM forces and moments. Because of this fact, the pressure data on the aft portion of the SRM's may contain sting interference effects and should, therefore, be used with caution. Additional force tests are planned to obtain connection factors which can be used with the integrated pressure data to eliminate this problem.

DATA REDUCTION

The pressure data were reduced to nondimensional coefficient form using the following equation:

$$C_{P_X} = (P_X - P_{\infty})/q$$

where X indicates the pressure orifice number.

Model reference dimensions were:

PARAMETER	FULL SCALE	MODEL SCALE
S _{ref} , Reference area	2690 ft. ²	6.198 in. ²
<pre>lref, Reference length</pre>	1328 in.	5.313 in.
b _{ref} , Reference span	1328 in.	5.313 in.
Moment reference point (measured from ET nose and as a reference. Cor- responds to longitudinal position of Orbiter nose on ET (.) ORBITER		
۱ (at orbiter nose)	635 in.	2.549 in.
YMRP (on ET & Orb.	0	0
Z _{MRP} (1.332 inches below Orbiter (on ET ()	333 in.	1.332 in.
ET		
X_{MRP} (2.549 inches aft of ET n	ose)635 in.	2.549 in.
Y _{MRP} (on ET &)	0	0
Z _{MRP} (on ET (2)	0	0

Ü

	PARAMETER	Full Scale	MODEL Scale
SRM			
X _{MRP}	(0.8017 inch aft SRM nose)	635 in.	2.549 in.
YMRP	(0.972 inch to right of left SRM &)	243 in.	0.972 in.
Zwoo	(on ET & SRM C)	0	0

REFERENCES

- 1. Simon, Erwin, "The George C. Marshall Space Flight Center's 14 x 14.

 Inch Trisonic Wind Tunnel Handbook," NASA TMX-53185, December 22,

 1964.
- Lott, R. and Ramsey, P. "An Investigation of the Load Distribution Over The SRB and External Tank of a 0.004 Scale Model of the 049 Space Shuttle Launch Configuration," NASA CR-120,058 (DMS-DR-1255), March, 1973.
- 3. Ramsey, P., Buchholz, R., Allen, E. and Dehart, J., "Determination of the Aerodynamic Interference Between the Space Shuttle Orbiter, External Tank, and Solid Rocket Booster on a 0.004 Scale Ascent Configuration," NASA CR-120,060 (DMS-DR-2010), April, 1973.
- 4. Ramsey, P., Davis, T., "Triple Balance Test of PRR Baseline Space Shuttle Configuration on a .004 Scale Model of the MCR 0074 Orbiter Configuration in the MSFC 14 x 14 Inch Trisonic Wind Tunnel (TWT 570) [IA31F(B)]," NASA-CR-134,436 (DMS-DR-2028), December, 1974

	TABLI	L. 1.	T
T : MSFC TWT 567			DATE May 24, 1
	TEST CON	D. ONS	
MACH NUMBER	REYNOLDS NUMBER (per foot)	DYNAMIC PRESSURE (pounds/sq. inch)	STAGNATION TEMPERAT (degrees Falvenheit)
0.6	5.0 x 10 ⁶ /Ft.	4.4	100
0.9	6.3 x 10 ⁶ /Ft.	7.5	100
1.05	6.6 x 10 ⁶ /Ft.	8.5	100
1.25	6.7 x 10 ⁶ /Ft.	9.5	100
1.46	6.4 x 10 ⁶ /Ft.	9.6	100
1.96	7.1 x 10 ⁶ /Ft.	10.5	100
2.99	4.1 x 10 ⁶ /Ft.	5.3	140
3.48	5.3 x 10 ⁶ /Ft.	5.8	140
BALANCE UTILIZED:	None		
	CAPACITY:	ACCURACY:	COEFFICIENT TOLERANCE:
Ср			+ 0.025 @
o _r			q = 10 psi
COMMENTS:			
	•		

TABLE II

TEST: MASEC 567 DATA SET RUN NUMBER COLLATION SUMMARY DATA SET RUN NUMBER COLLATION SUMMARY DATA SET CONTIGNATION OF 12								1	!										I
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53/2 753/2 0.3 -10 6.5 -14 76 6.6 1.781 1.281 1.381 1.481 1.781 1.781 1.881 1.781 1.		GURATION	2	_	7 0	1	3	P S		6.3	1.05		1.46	1.36	2:75				
2 C	1		ਙ		3	166 1	0/6		11.00	124	1341	14A.	1.57						
1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.6 1.7 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6	1		95	0		<u> </u>	-		1181	128	138	14 61	158	1681	1781	1831			
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\$3/2 TY \$3/2 O3 O TO 0.5° 1.4 796 % 21 A1 22A1 23A1 24A1 25A1 C -4 C -				0					11.51	1271	1331	14.51	153	1631	175,	1631	· · ·		เทน
53/2 77 53/2 03 0 10 05 14 % 0 % 2 21A1 22A1 23A1 24A1 25A1 27B1 27B1 27B1 27B1 27B1 27B1 27B1 27B				0		-	-		", K,	1211	13KI	14KI	15K						NUM
53/2 T7 53/2 O3 0 40 0.5'.14 790 % 21AI 22AI 23AI 24AI 25AI 0 -8 - T - 2 18I 22BI 22BI 23BI 24BI 25BI 27BI 27BI 28BI 0 0 -4 21DI 22DI 23DI 24DI 25DI 25DI 28BI 0 0 0 11FI 12FI 13FI 14FI 15FI 16FI 17FI 18FI 0 4 21HI 22HI 23HI 24HI 25HI 25HI 25HI 25HI 25HI 25HI 25HI 25								_											вен
C -4	53/2	1					0)		21A	122A	123A	124A	125.0						٠.
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7 13 19 25 31 37 43 49 55 61 E ⁻ COEFFICIENTS			4.	SCI					215	2251	133	1243	25.5	1263	12731	25 JI			
7 13 19 25 31 37 43 49 55 61 E 1.31				0,		-	-		21K	122K	23K	747 I	25K	_	-				
cack 13 19 55 31 37 43 49 55 61 ET COEFFICIENTS												_							
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COEFFICIENTS	Characa	********	4	4	1	4	4	4	1	4	4	4	4	4	4	1	4	4	1
8 80 8						ರ	EFFI	CIENT	S						น์		11 4 . ,	•	ر (أ
								Ì	1										

TG, external tank; SO, SRM Bloster; UO, Orbiter upper wing, LO, Orbiter lower wing; SC, SRM cone; SS, SRM Schroud Datasets R82XXI, 2, 3, and 4 do not contain Orbiter data at M=2.99 and M=3.48. Datasets R62XXI, and 6 contain no Orbiter data.

TABLE II (Continued)

FST: MCZC	2 567	L	2	1 2	1/8	2	ABER		DATA SET/BIIN NIMBER COLLATION SUMMARY	NOS 7	AARY		DATE	May	24,	1973	
			:				Q ₂	1	1	Seros	9 80	TERN	ACCUMINATION (OB A) TERNATE INDEPENDENT	EPENDI	ENT VARIA	ABLE)	
DATA SET	CONFIGURATION	SCHD.		CONTROL DEFLECTION	BETLE 1984	EFLECTION	OF	70	00	20160	1.25	1.4	1.46 1.76 2.99	2.99	3.4b		
	C3/2 TGC 212 / 2	V	1 4			1%		3101	320	330	34D	1350	3.101 32D1 33D1 34D1 35D13wD1		1088 101E		
C 7777 2	en 3/ce 1 1 3/ce	170	0	11-	1 -	 		III	1251	1351	141	151	1151 1211 1351 1411 1511 1611 1751 181	17.1	1181		1
		5	4		-	-		31111	32.H.I	33HI	34#	HEET	3141 3241 3341 3441 3541 3641 3741 3841	137#	13841		
			_										_				
4	50 452 27 462	V	00-	05 14	3/5	6		410	4 101 42 01 4301	4301	44DI	450	1 4@D1		41W 48W		
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TEST:	1	IDEN	RS																			٠	2		

TABLE III

MODEL DIMENSIONAL DATA

MIGHE COMPONENT: BODY - BIO Body		
GINERAL DESCRIPTION: Fuselage, 2A Configurat	ion, Lightweight Orl	oiter,
Scale Model = 0.004		
VL70-000089 "B" ORAWING NUMBER: VL70-000092, 93, 94 "A"		
DIMENSIONS:	FULL SCALE	MODEL SCALE
Length in.	1328.3	5.313
Max. Width in. (@ Xo = 1528.3)	265.0	1.060
Max. Depth in. (@ X _o = 1480.52)	248.0	0.992
Fineness Ratio Area Ft ²	5.012	5.012
Max. Cross-Sectional	456.4	1.826
Planform		
Wetted		
Base		

MODEL COMPONENT: BODY - COROBY - C5	M'	
GENERAL DESCRIPTION: 2A Configuration Per Line VL70-000092	u	
Scale Model = 0.004		
DRAWING NUMBER: VL70-000092		
DIMENSIONS:	FULL SCALE	MODEL SCALE
Length (STA Fwd Bulkhead)	391.0	1.564
Max. Width (T. E. Bulkhead)	560.0	2.240
Max. Depth (WP $z = 421.922$ to $z = 500$)		
Fineness Ratio	<u> </u>	
Area		
Max. Cross-Sectional		
Planform -		
Wetted -		·
Base		

MUDEL COMPO	ONENT: BODY - Manipulato	r Housing D-7		
GENERAL DES	SCRIPTION: <u>2A Configurat</u> 092	ion Per Rockwel	l Lines	
Scale Mo	del = 0.004			
DRAWING NU	MBER: VL70-000093			
DIMENSIONS	:		FULL SCALE	MODEL SCALE
Leng	th in.	•	881.00	3.524
Max.	Width in.		51.00	0.204
Max.	Depth in.		23.00	0.092
Fine	eness Ratio			-
Area	.			
	Max. Cross-Sectional		•	
	Planform	••		
	Wetted	•		هد میاد است.
	Rase		•	
Fuselage	BP = 0.00 WP = 500.00 INFS X.426.0 to 1307.0 INFS	•		

MODEL COMPONENT: BODY - F4 Body Flap		
GENERAL DESCRIPTION: 2A Configuration I	Per Rockwell Lines VL70-0	000094A
Scale Model = 0.004		
DRAWING NUMBER: VI70-00094A		
DIMENSIONS:	FULL SCALE	MODEL SCALE
Length	84.70	0.339
Max. Width	265.00	1.060
Max. Depth	(
Fineness Ratio	(1)	
Area _{Ft} ²		
Max. Cross-Sectional		
Planform	142.64	0.571
Wetted .		
Base Pt ²	38.65	0,0006

MODEL COMPONENT: BODY - OMS POD - M3		
GENERAL DESCRIPTION: 2A Lightweight Configuration VI.70-000094A	ion Per Rockweil I	Lines
Scale Model = 0.004		
DRAWING NUMBER: VL70-000094A		
DIMENSIONS:	FULL SCALE	MODEL SCALE
Length	346.0	1.384
Max. Width X ₀ = 1450.0	108.0	_0.432
Max. Depth X ₀ = 1500.0	113.0	0.452
Fineness Ratio		
Area		
Max. Cross-Sectional		
Planform		
Wetted -		
Base		-
C OF PMS POD		
WP = 463.9 INFS : WP 400 + 63.9 = 463.9		
BP = 80.0 TNFS		

Length 1214.0 to 1560.0 = 346.0 INFS

gene ral	DESCRIPTION:	Orbiter Configu (Dihedral angle at the 75.33% e pendicular to	ration Per Lin is defined at lement line pr	the lower surtace of the lower	e of the wing
VIL7	0-000093	-pandiciuar ro r	ne kri.)	i	
	le Model = 0.0	004			
EST NO.	<u>.</u>	•	•	DWG. NO. VL7	0 -000093
CIMENS I	<u>:::::</u>			FULL-SCALE	MODEL SCALE
TOT	FL DATA		•		
	Area (ineo.)	Ft ²	• • •	3.1.3	
	Planform		•		0.043
	Span (Theo In	•	<i>,</i>	936.68	3.747
	Aspect Ratio	•		2,265	2.265
	Rate of Taper	•••	: .	1.177	1.177
]	Taper Ratio	•		0.200	0.200
	Othedral Angle	, degrees	•	3.500	3.500
	Incidence Angl	e, degrees.	•	3.000	3.000
	derodynamic Tw	ist, cegrees		+3.000	+3.000
	Sweep Back Ang		,		
	Leading Ed			45.000	45,000
	Trailing E	age		10.24	-10.24
	0.25 Eleme Chords:	nt Line	. •	35.209	35,209
•		12000			
) 3.2.0.0.		689_24	2.757
	Tip, (Theo) b.r.		137.85	0.551
		of .25 MAC	·	474.81	1.899
	W.P. of .2		~	1136.89	4.458
	B.L. of .2			299.20	1.197
EVA	· · · · · · · · · · · · · · · · · · ·	3 MAC	•	182.13	0.728
	SED DATA	2	•		
- 1	hrea (ineo)	Ft ²	•	1752.29	0.028
	Span (Theo)	In. BP108		720.68	2.883
	Aspect Ratio			2.058	2.058
	aper Ratio			2451	
•	Chords		•		
	Root BP108			_562_40	2.250
	Tip 1.00 b		• • • • • • • • • • • • • • • • • • • •	137.85	0,551
	MAC 2			393.03	1.572
	Fus. Sta.	of .25 MAC	•	1185.31	4.741
	W.P. of .2	5 MAC			1.201
	B.L. of .2	5 MAC	,	143.76	0.575
ŀ	Airfoil Section	n (Rockwell Mas XXXX-64	NASA)		
	Root b =	0.425		10	.10
	Tip b =	1.00	•	12	.12
ata for	r (1) of (2) s	i don			
, A.	Leading Edge o	11462 1166			
i	Leading Edge C Planform Area	" F. 2		440	
· i	Leading Edge 1	ntersects Fus M.	. 42 4	120.33	0010 2.240
ì	Leading Edge	ntersects Wing	L. W JEG Cts	560.0	4.14
		arres ming	466	1035.0	4.14

MODEL COMPONENT: Playon E-18			
GENERAL DESCRIPTION: 2A Configuration	ion Per W-87		
Rockwell Lines VL70-000093	•		-
Data for (1) of (2) Sides			
Scale Model = 0.004	 		
DRAWING NUMBER: VL70-000093	<u>.</u>		
DIMENSIONS:	THEORE	TICAL A	CTUAL MEASURED
-	FULL SCALE	MODEL SCALE	MODEL SCALE
Area FT ²	205.52		0.003
Span (equivalent) in.	_353.34		1,413
Inb'd equivalent chord	_114.78_		0.459
Outb'd equivalent chord	55.00		0.220
Ratio movable surface chord/ total surface chord			
At Inb'd equiv. chord			.208
At Outb'd equiv. chord	400		400
Sweep Back Angles, degrees			
Leading Edge	0.00		0.00
Tailing Edge	-10.24		-10.24
Hingeline	0.00		0.00
Area Moment	1548.07		0.0001
(Normal to hinge line) Froduce of Area Moment	₁ 3		

MODEL COMPONENT: VERTICAL - V5	(Light Wt. Orbite	r Configuration)	
GENERAL DESCRIPTION: Centerline			
Airfoll with Rounded Leading Ed	ge		
			•
Scale Model = 0.004			
DRAMING NUMBER:	VI.70-000095		•
DIMENSICHS:	•	FULL-SCALE	MODEL SCALE
TOTAL DATA			
Area (Theo) Ft ²		413.25	0.007
Planform Span (Theo) In		315.72	1.263
Aspect Ratio		1.675	1.675
Rate on Taper Taper Ratio			0.507
Sweep Back Angles, degrees	•	4-4-4-4	
Leading Edge	•	45.000	45.000
Trailing Edge		26.249	26.249
0.25 Element Line		41.130	41.130
Chords:	•	• •	
Root (Theo) WP		268,50	1.074
Tip (Theo) WP	•	108.47	0.434
KAC SAC SE MAG	•	199.81	0.799
Fus. Sta. of .25 MAC		1463.50	5.854
W. P. of .25 MAC B. L. of .25 MAC	~ .	635.522_	2.542
Airfoil Section		0.00	0.00
Leading Wedge Angle	Cec	10.000	10.000
Trailing Wedge Angle		10.000 14.920	14.920
Leading Edge Radius ~	, i e	2,00	0.008
Void Area ~ Ft?		13.17	0.0002
Blanketed Area~Ft2		12.67	0.0002

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MODEL COMPONENT: R5-Rudder			·		
GENERAL DESCRIPTION: 2A Configuration Per Rockwell Lines VL70-000095					
Scale Model = 0.004					
DRAWING NUMBER: VL70-000095					
<u>DIMENSIONS:</u> Area FT ²	THEORE	MODEL SCALE	MODEL SCALE 0.0017		
Span (equivalent) in. Inb'd equivalent chord			0.804		
Outb'd equivalent chord Ratio movable surface chord/ total surface chord	_50.833		0.203		
At Inb'd equiv. chord At Outb'd equiv. chord	0.400		0.400		
Sweep Back Angles, degrees Leading Edge	34.83		34.83		
Tailing Edge Hingeline	<u>26.25</u> <u>34.83</u>		<u>26.25</u> <u>34.83</u>		
Area Moment (Normal to hinge line) F	<u>526.13</u>		0,00003		

Produce to aera and mean chord

NODEL COMPONENT: BODY - External Tank T9				
GENERAL DESCRIPTION: 2A Configuration Per Rockwell Lines VL78-000018 and VL72-000061B: Body of Revolution, Without Retro Package				
Scale Model = .004				
DRAWING NUMBER: VL78-000018				
DIMENSIONS:	FULL SCALE	MODEL SCALE		
Length,in.	1989.00	7,956		
Max. Width (Dia), in.	324.00	1.266		
Max. Depth				
Fineness Ratio L/D	6_13889	6.13859		
Area, Ft ²				
Max. Cross-Sectional	572.55	0.000		
Planform		-		
Wetted -				
Base				

REF.

FS (Orbiter) = 0.00 = TANK Station 751 INFS

WP (ET) = 400 - 344.413 = 55.587 INFS

BP (Orbiter) = 0.00 = 0.00 ET

TABLE III (Continued)

MODEL COMPONENT: BODY - S3 Booster Solid Rocket Motor							
GENERAL DESCRIPTION: 2A Configuration Per Rockwell Lines VL77-000012 and							
Body of Revolution, Data for (1) of (2) Sides							
	••						
DRAWING NUMBER: VI.77-000012							
Data for (1) of (2) Sides							
DIMENSIONS:	FULL SCALE	MODEL SCAL					
Length, in. (including mozzle)	1758.00	7.032					
Max. Width (Dia) in. BSRM Tank	142.00	0.568					
Max. Depth (Dia) AFT Skirt	259.00	1.036					
Fineness Ratio	6.787	6.787					
Area, Ft ²							
Max. Cross-Sectional	365.87	0.0059					
Planform -							
Wetted -							
Base							

REF.

- FS (Orbiter) = 0.00 = 751 in. ET = 202.0 BSRM
- WP (BSRM) = WP 400 (Orbiter) 344.413 = 55.587 INFS
- BP (Orbiter) = 0.00 = 243.0 BSRM

()

TABLE III (Continued)

GENERAL DESCRIPTION: 2A Configuration Per Rockwell Lines VL72-000061B and VL78-000018							
Scale Mode	1 = .004			·			
PRANING NUMBE	R:-			• • •	•		
DIMENSIONS:		•		· •	FULL SCALE	MODEL SCALE	
Orbiter	Attach Sta	tion	•		1307 in.	5.228 in	
ET Atta	ch Station	•			2508 in.	8.232_in	
SRB Att	ach Station			•	1509 in.	6.036_tn	
Area	•	.*					
• •	ax. Frontal	Area	•		109 Ft ²	25 in. ²	
P1	lanform		•			(************************************	
	etted		•	•			
84	lse				•		

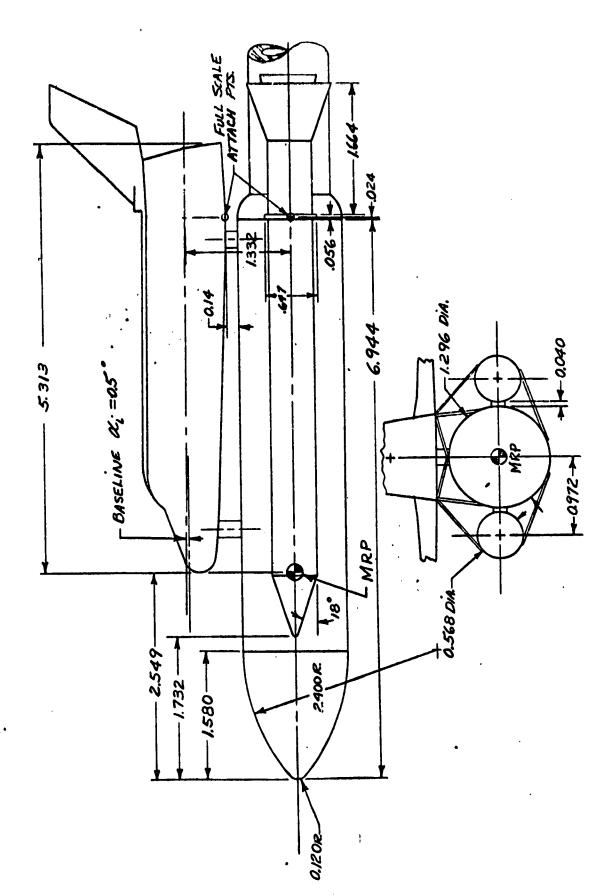


Figure 1. Major Dimensions of Model Components

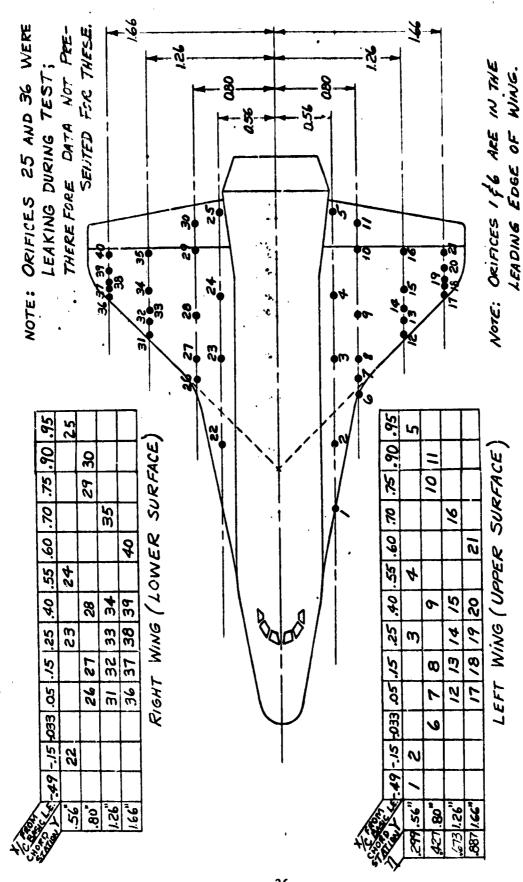
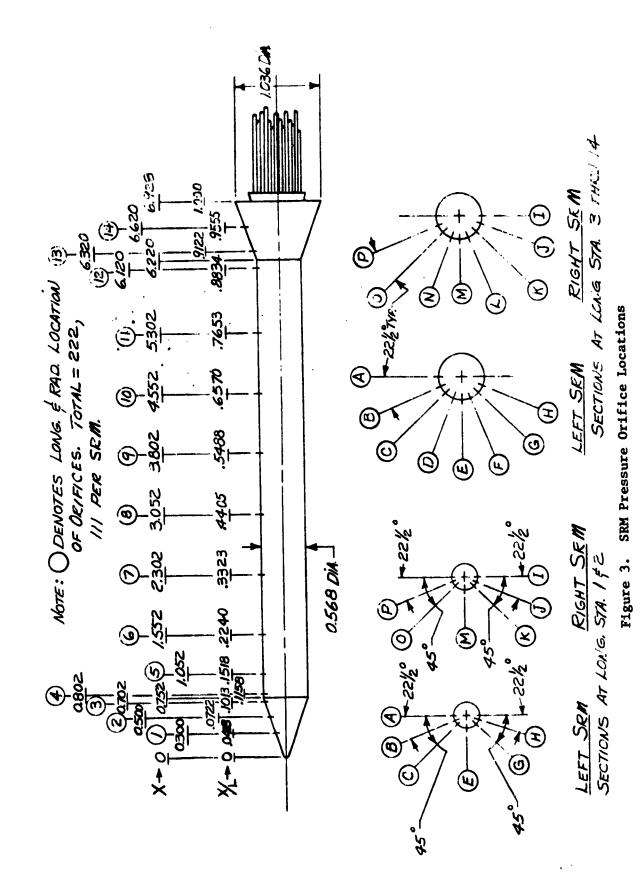


Figure 2. Orbiter Wing Pressure Orifice Locations and Numbering System



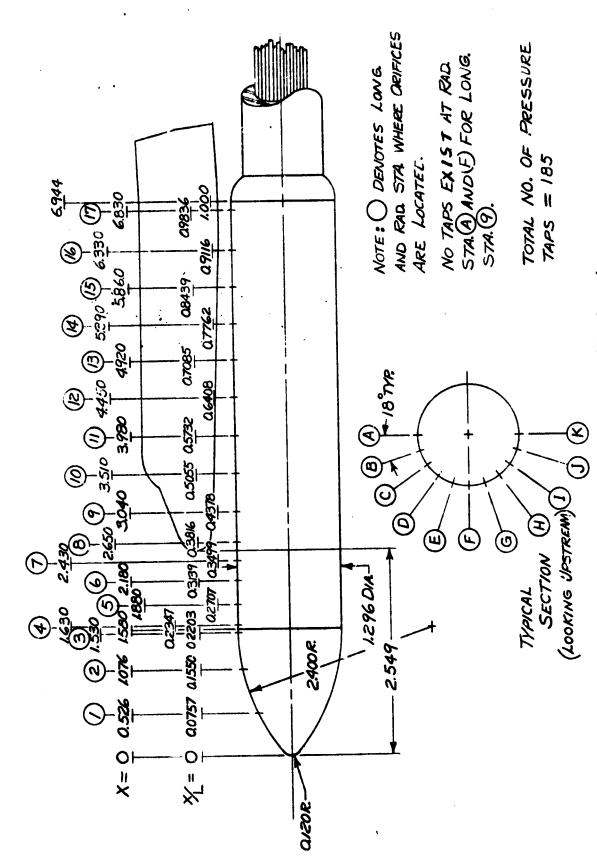
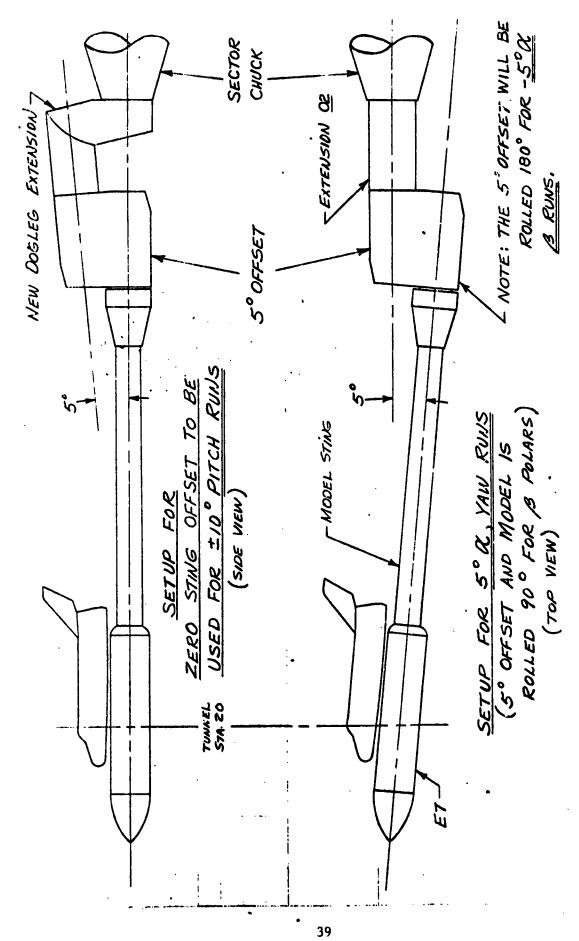


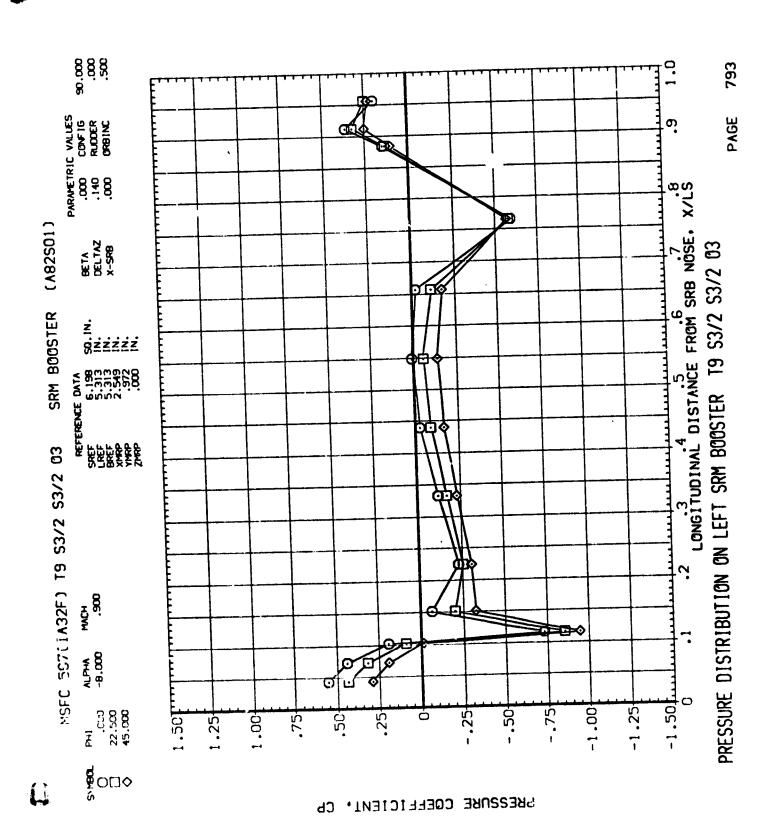
Figure 4. External Tank Pressure Orifice Locations

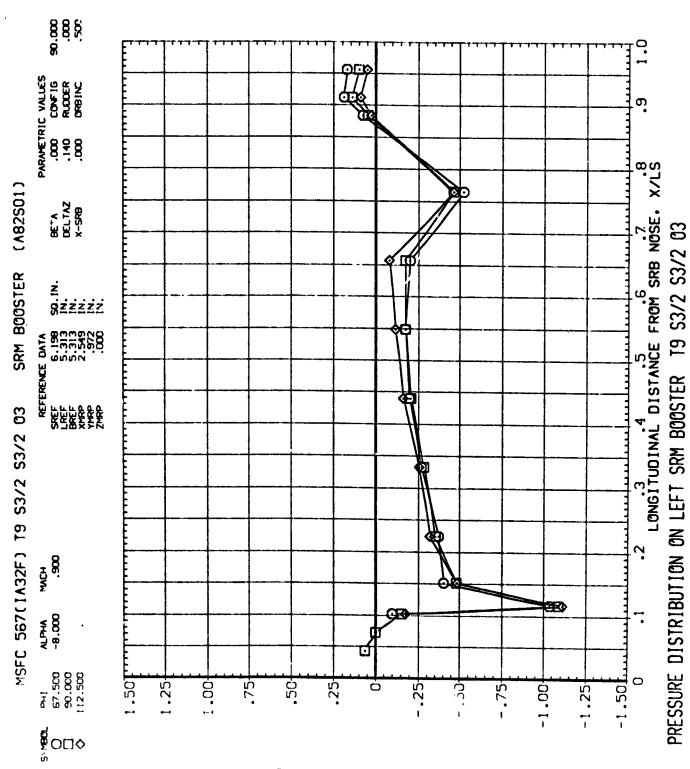


Sting and Model Configurations for Shuttle Launch Pressure Test Figure 5.

DATA FIGURES

Volume 1--ET (pgs. 1-792) Volume 2--SRM (pgs. 793-1452)



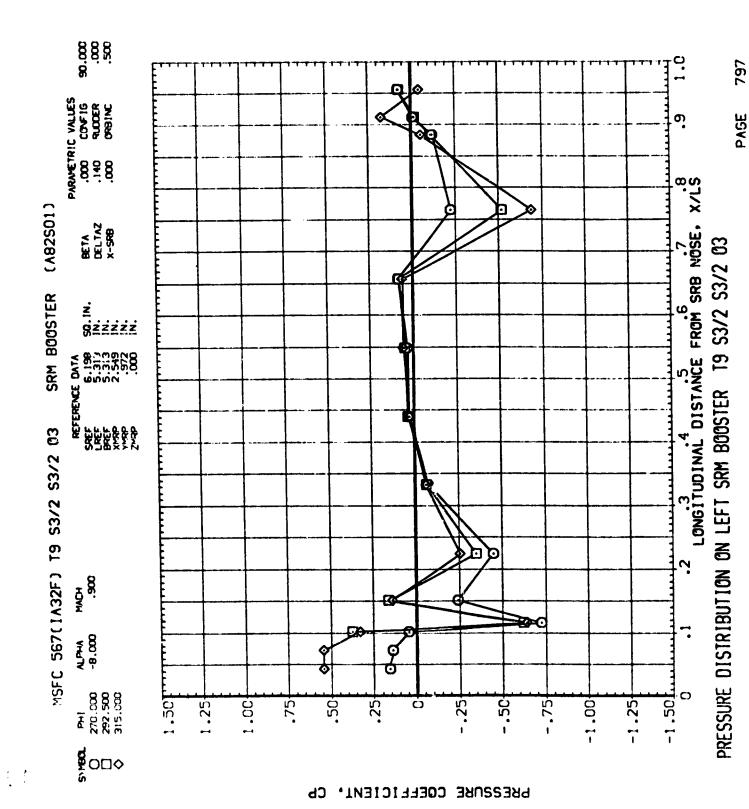


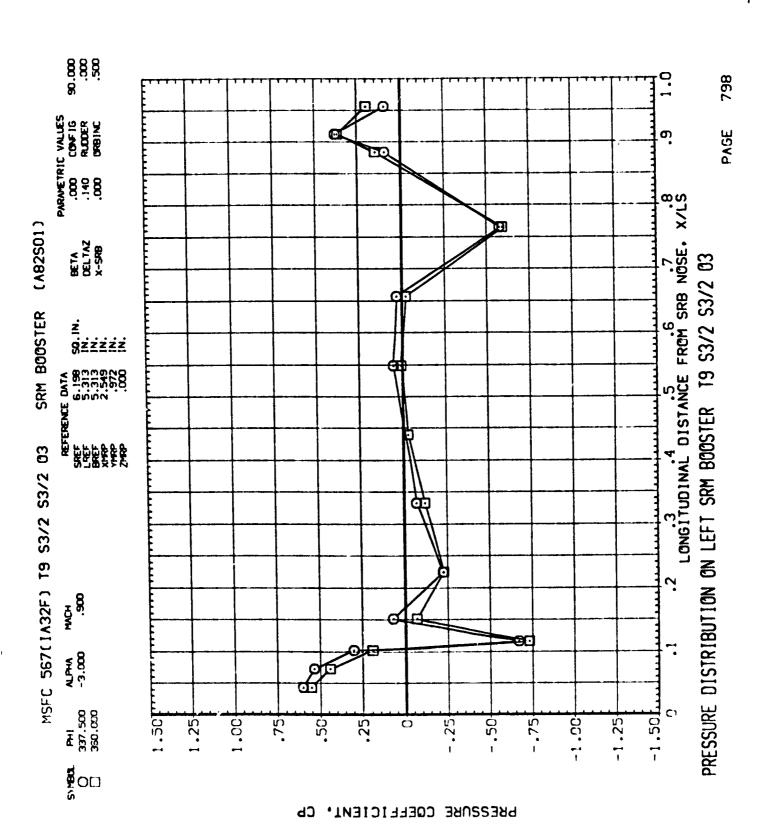
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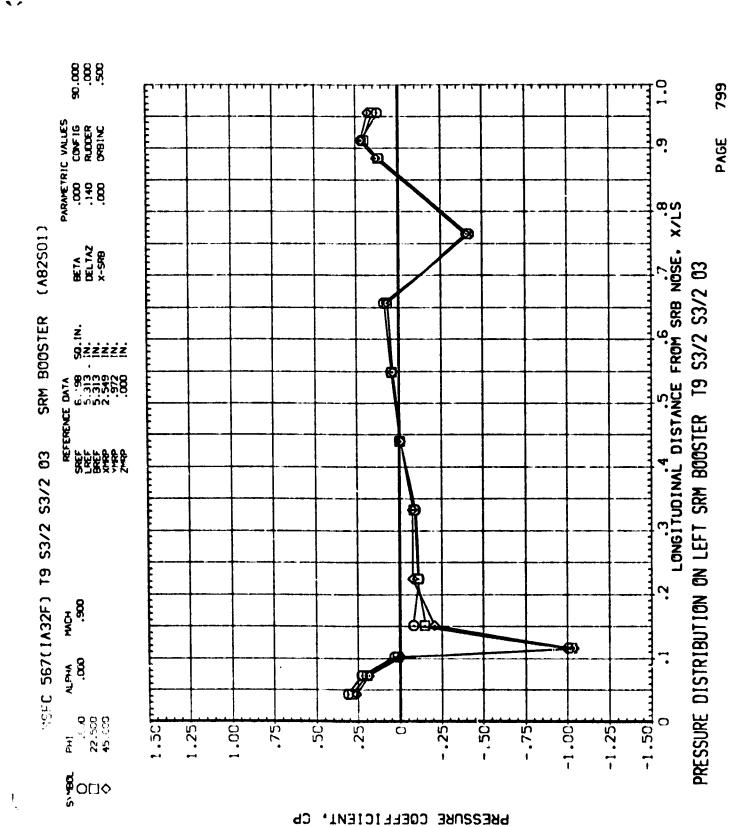
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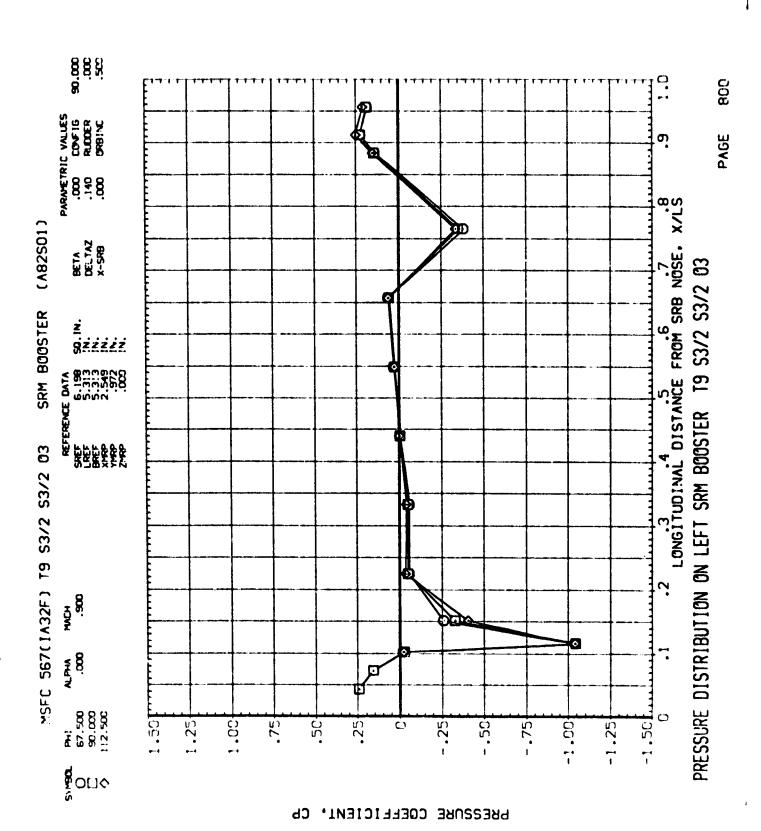
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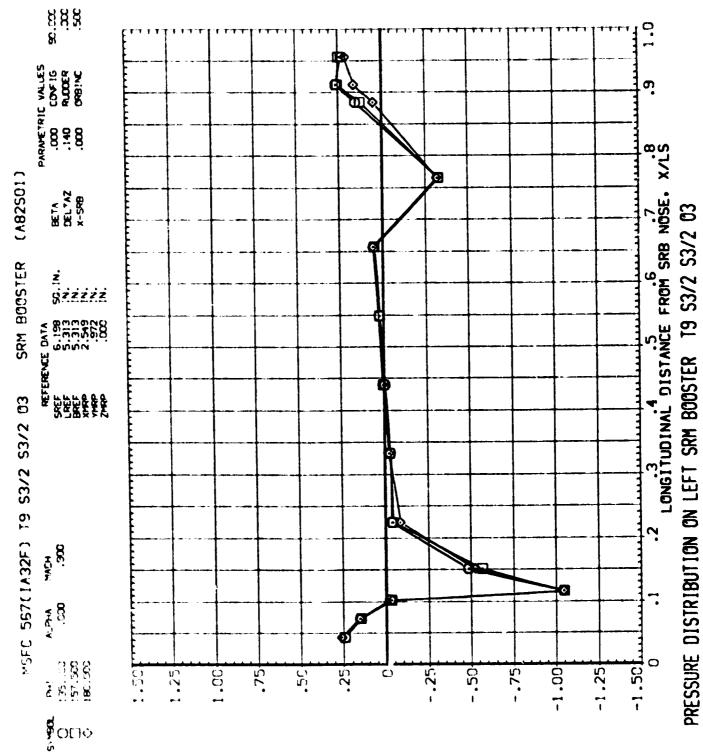
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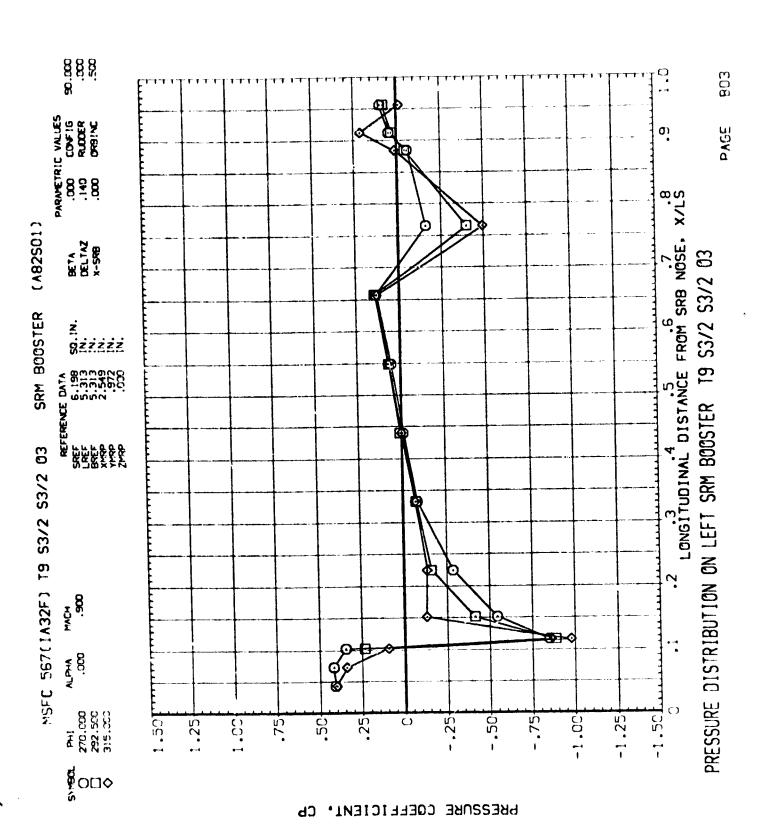






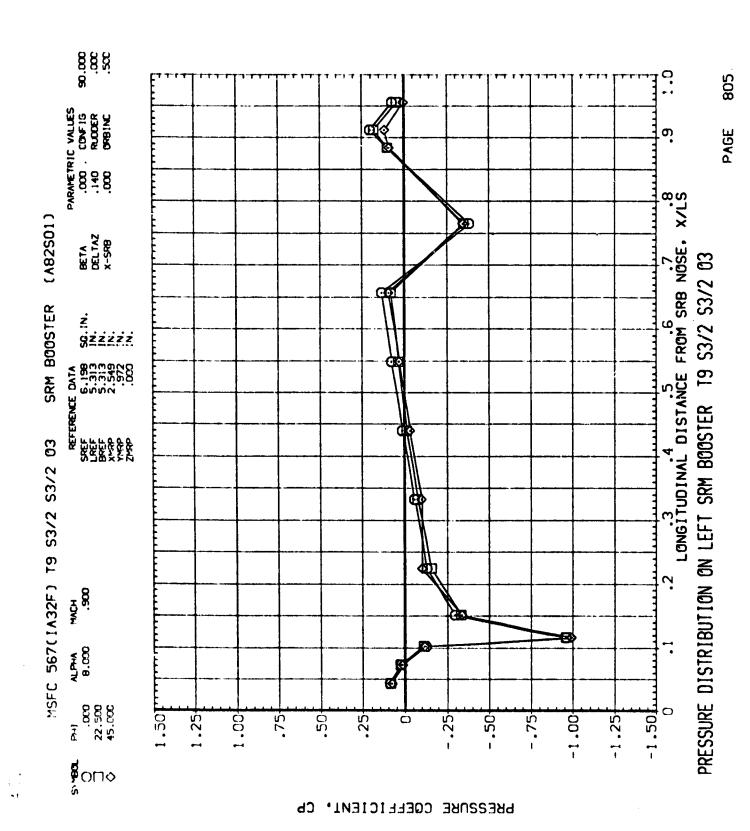


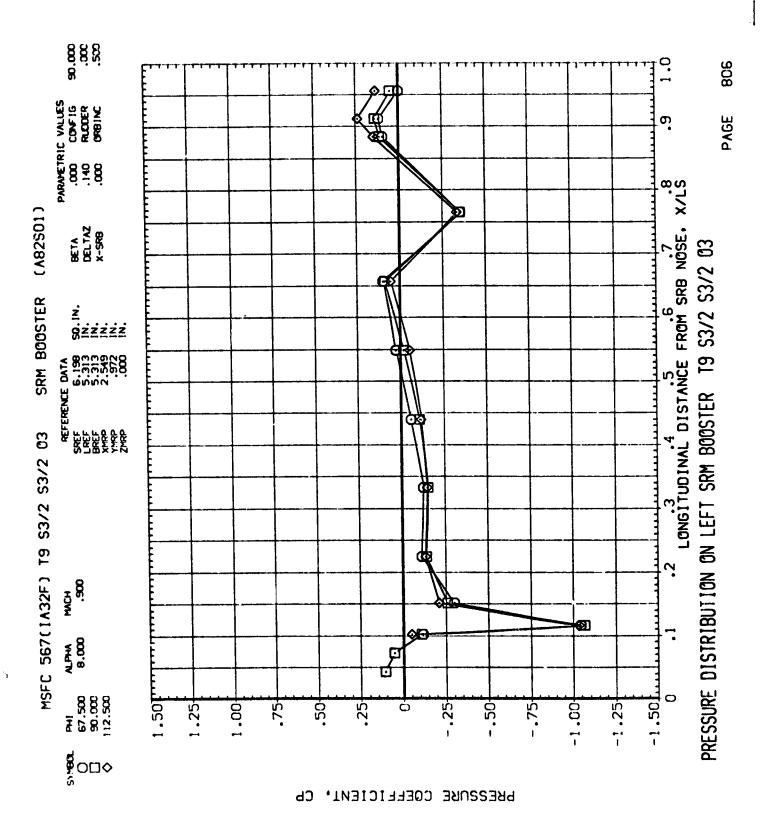
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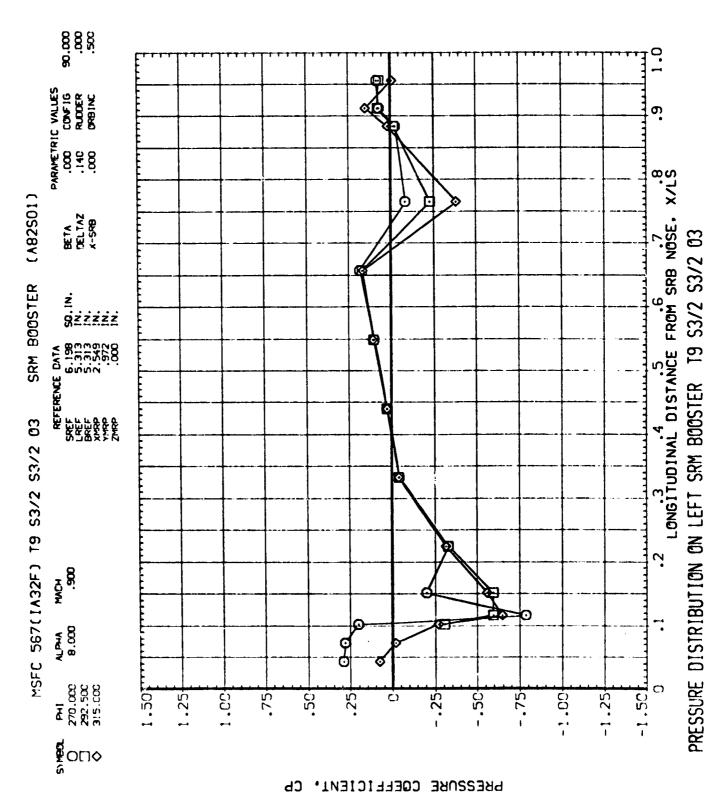
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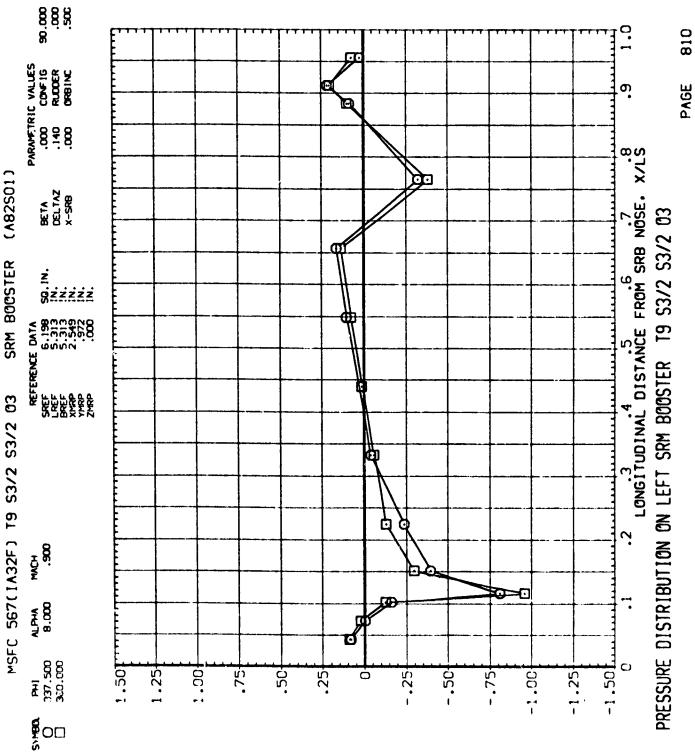
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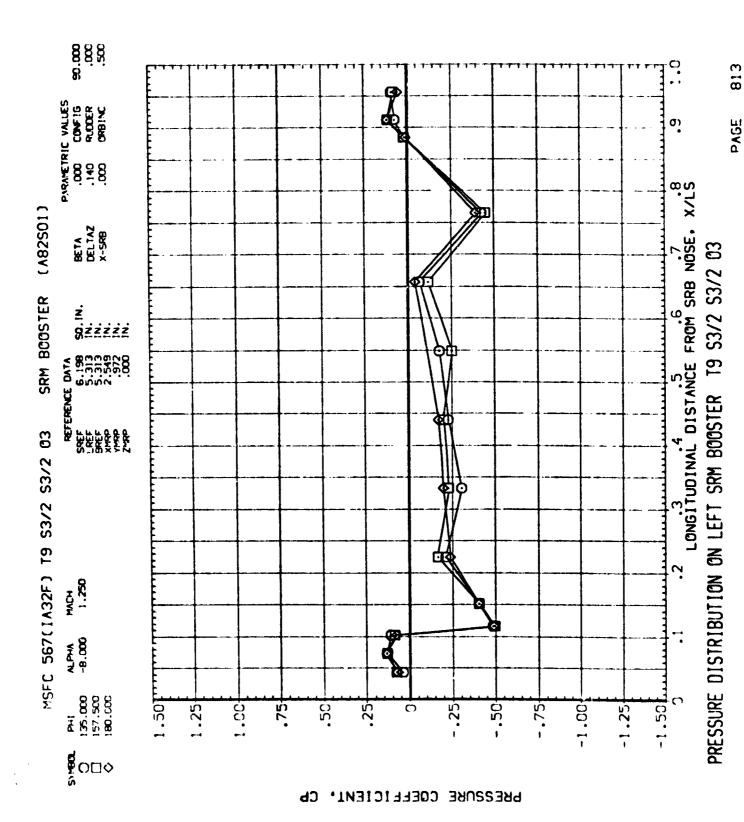
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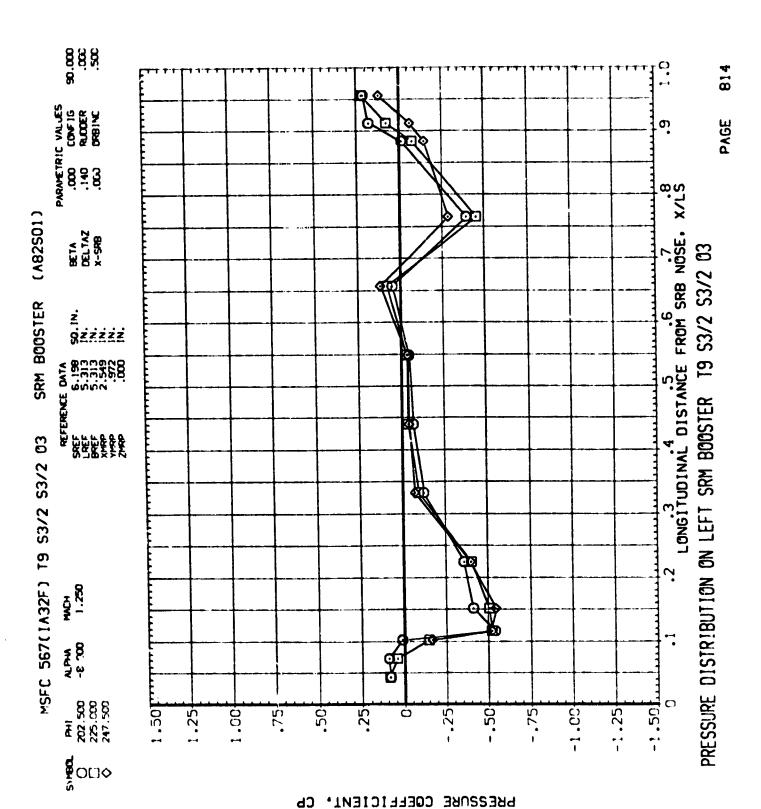


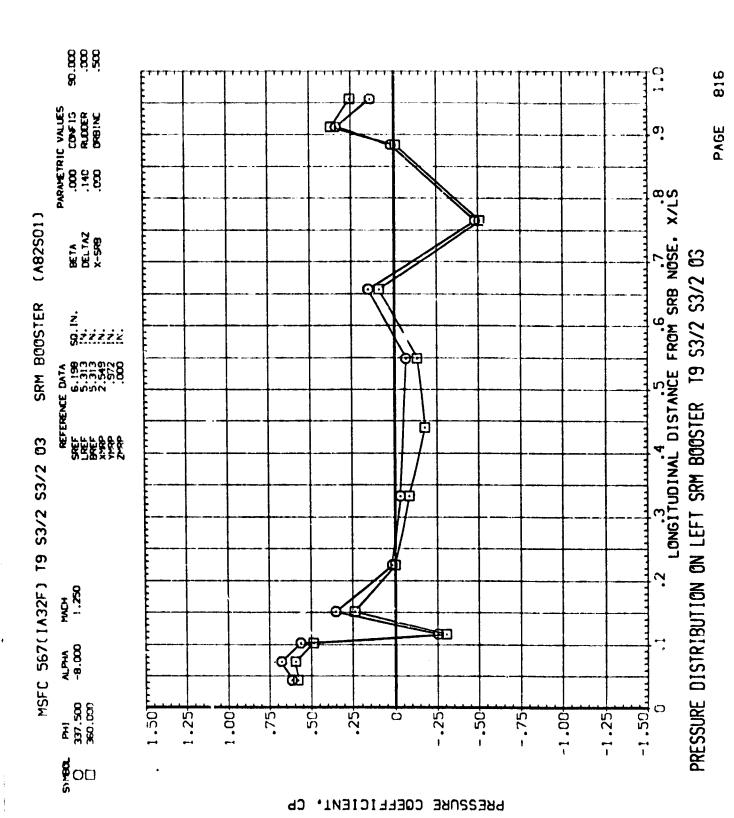
PRESSURE COEFFICIENT, CP

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PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER 19 S3/2 S3/2 03

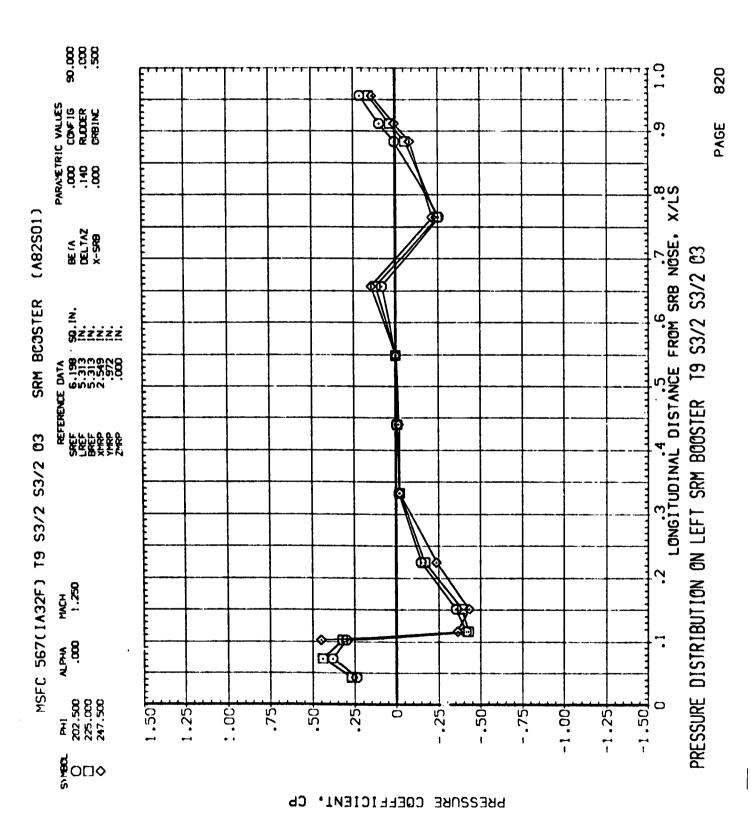
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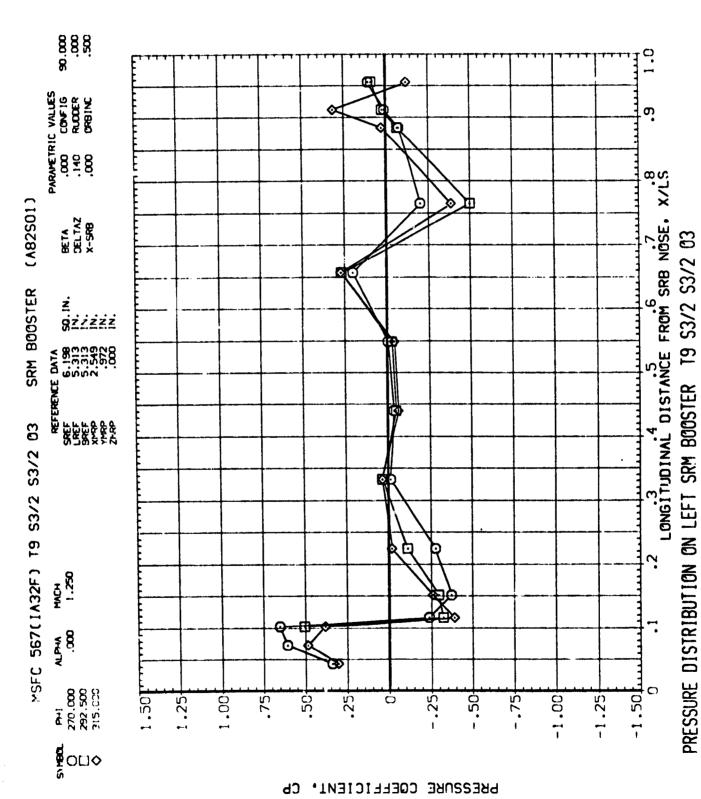
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PRESSURE COEFFICIENT, CP

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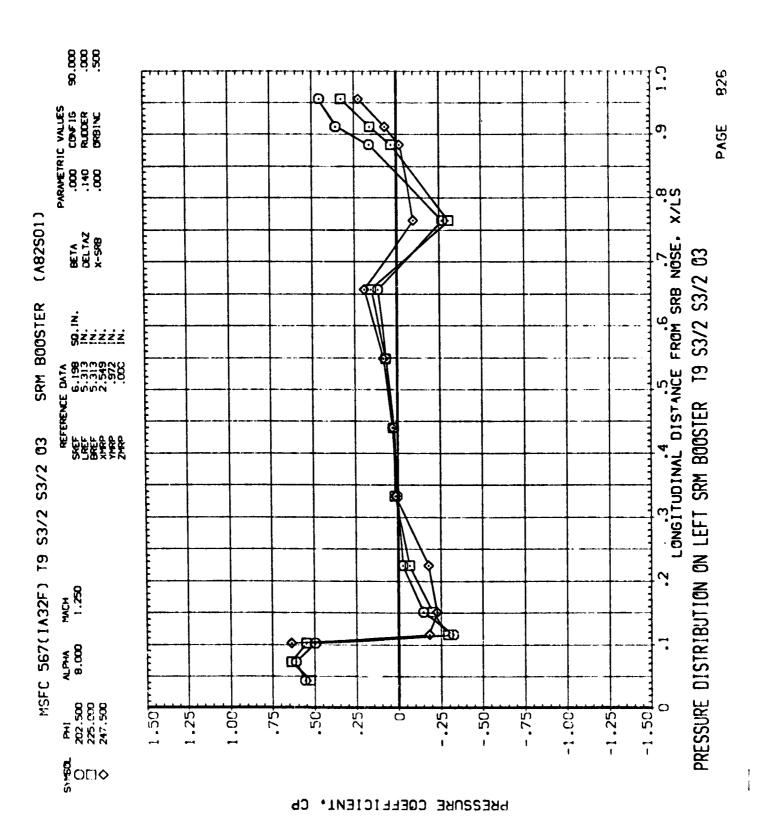


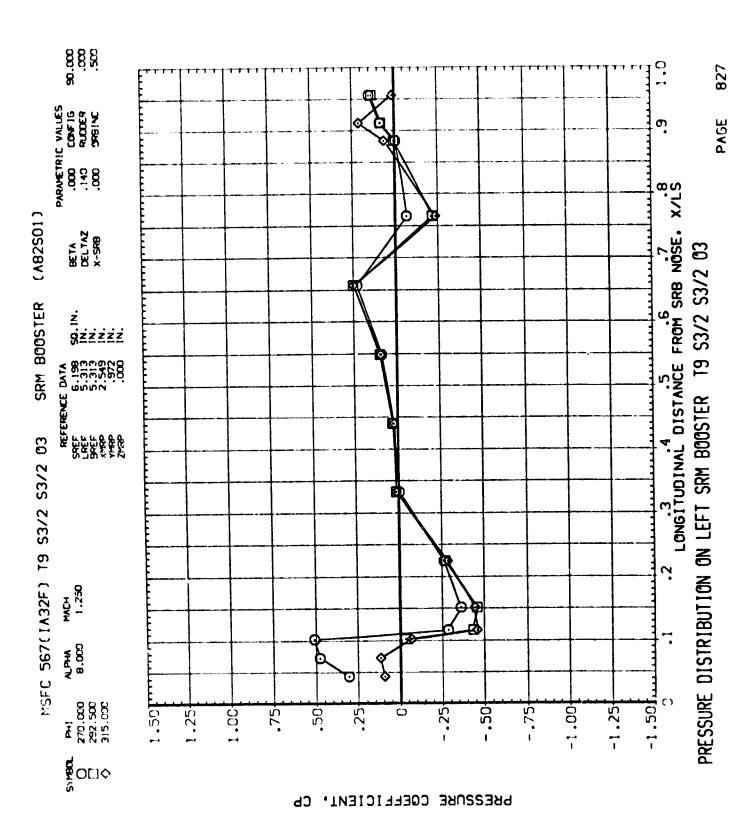
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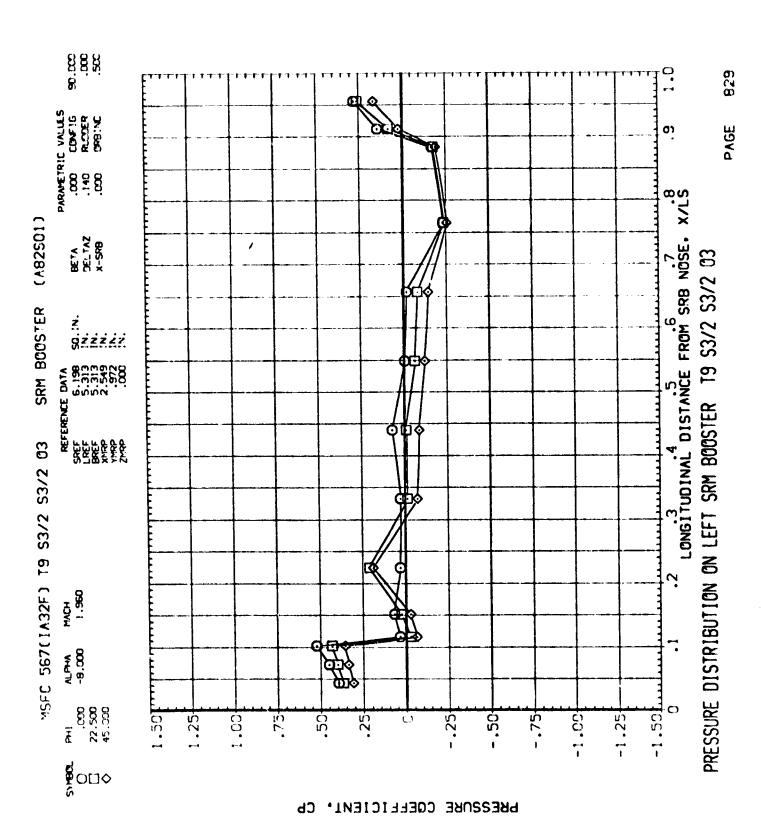
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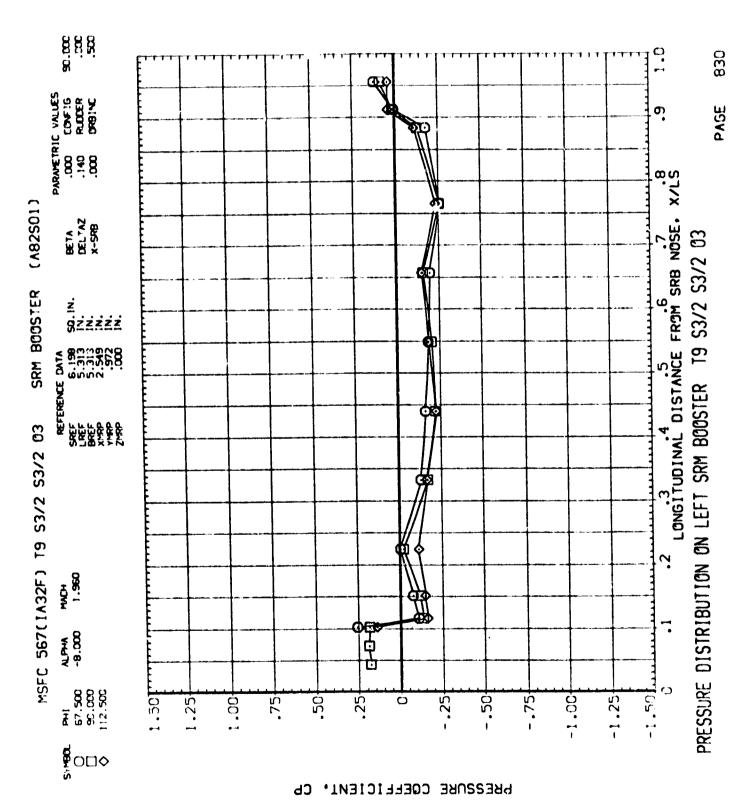
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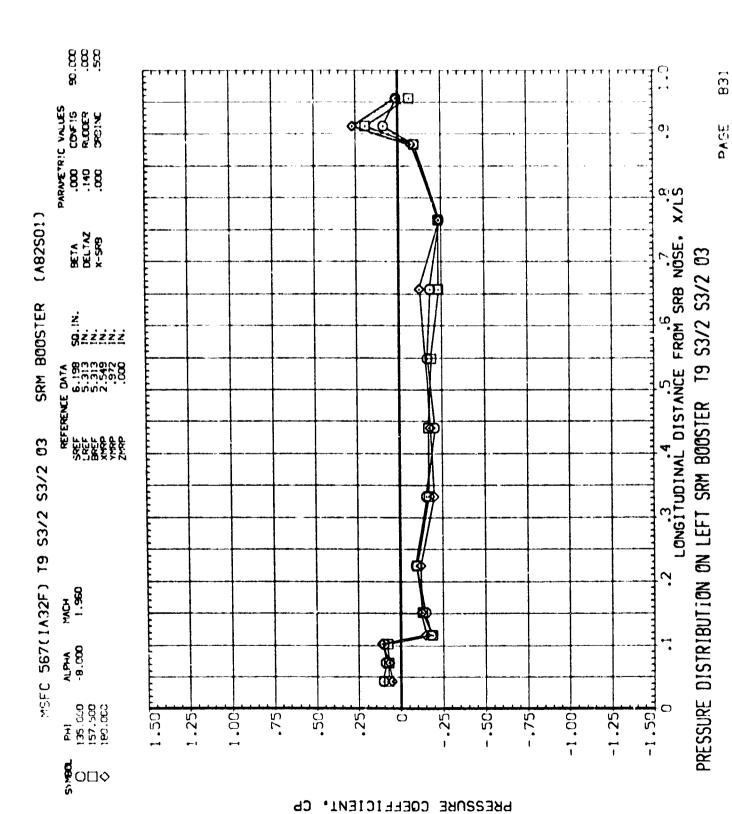


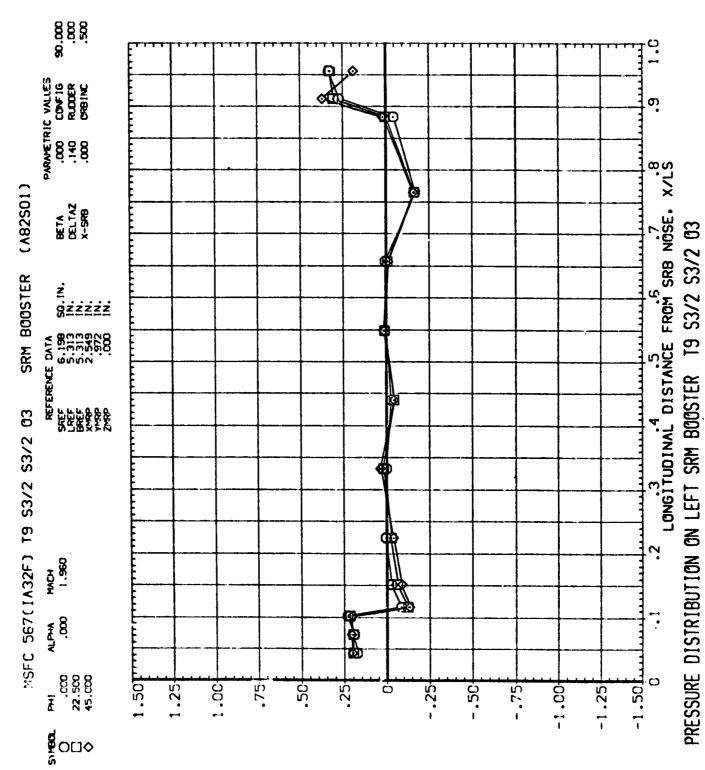


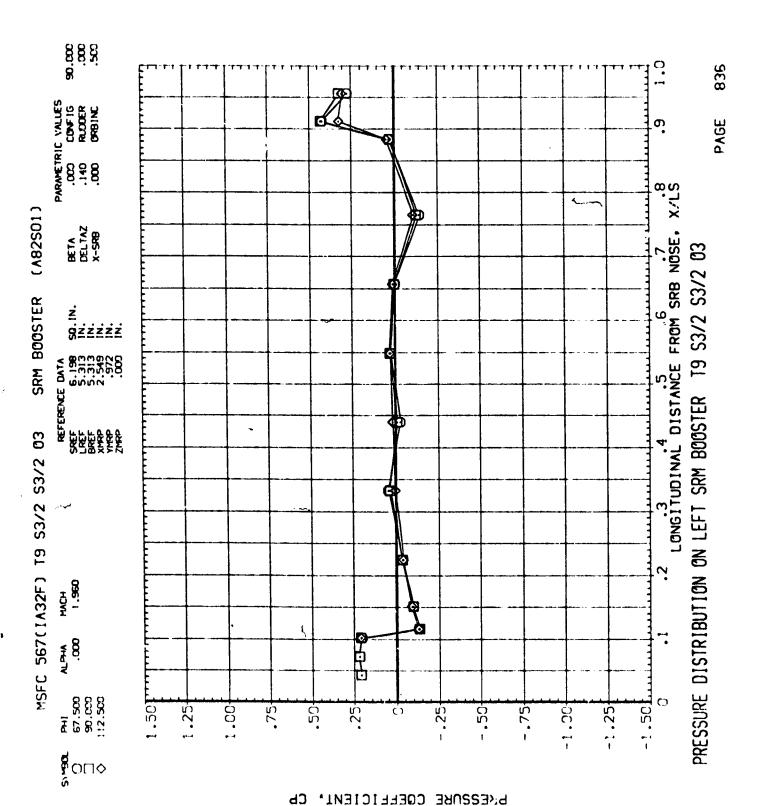
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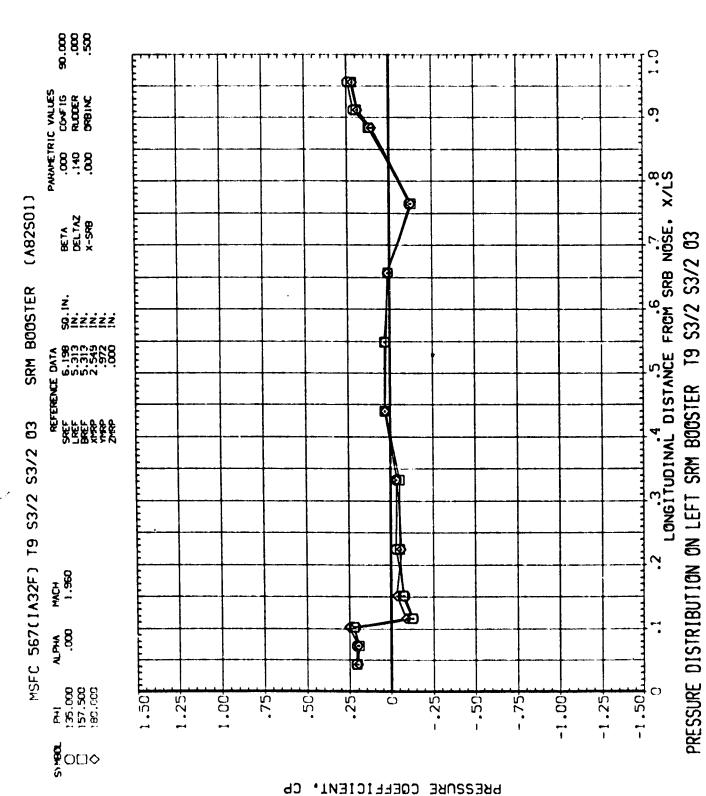












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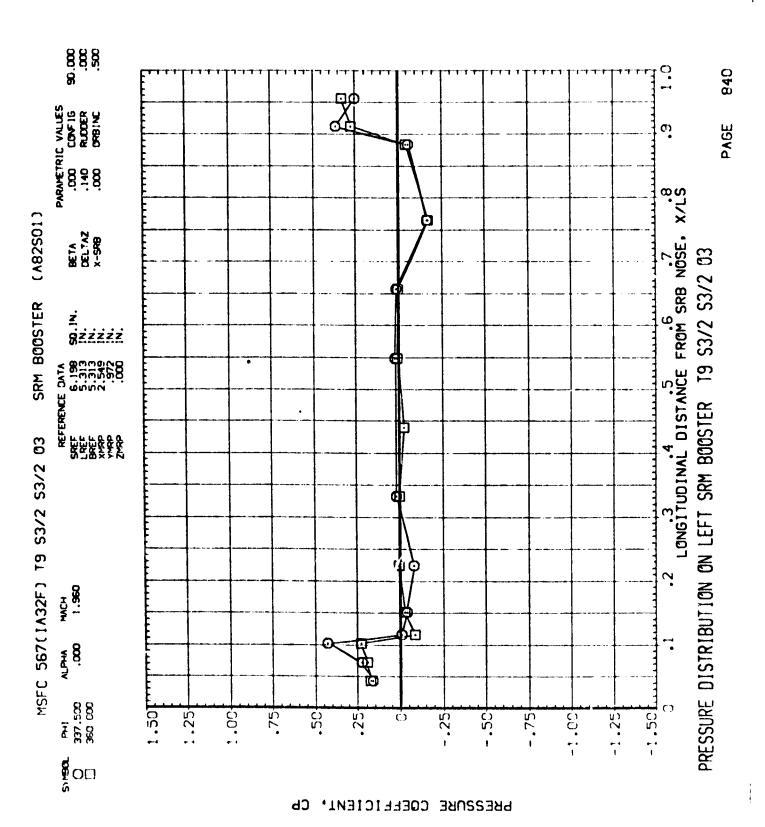
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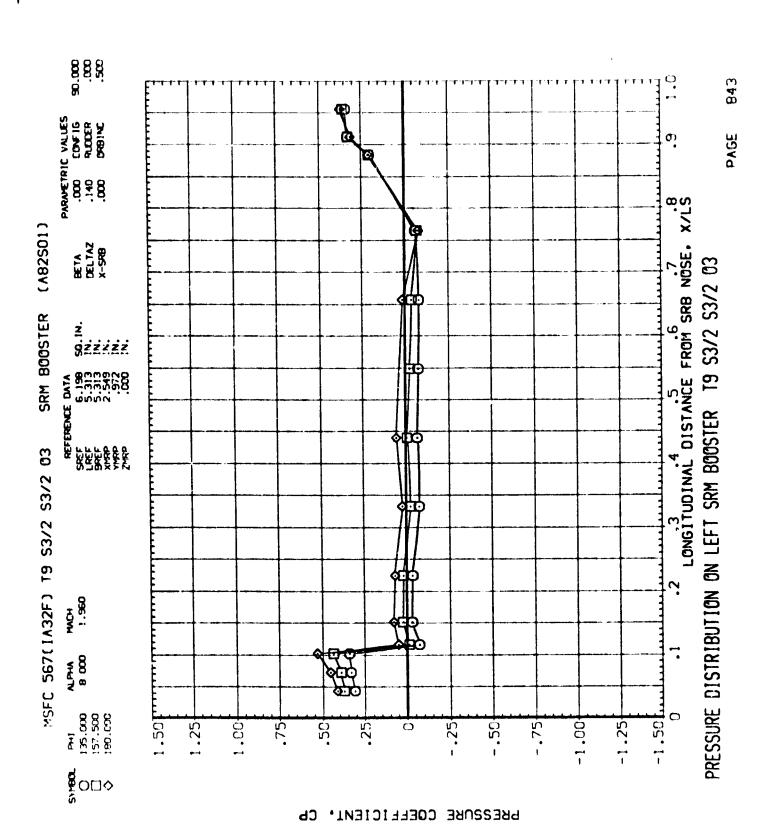
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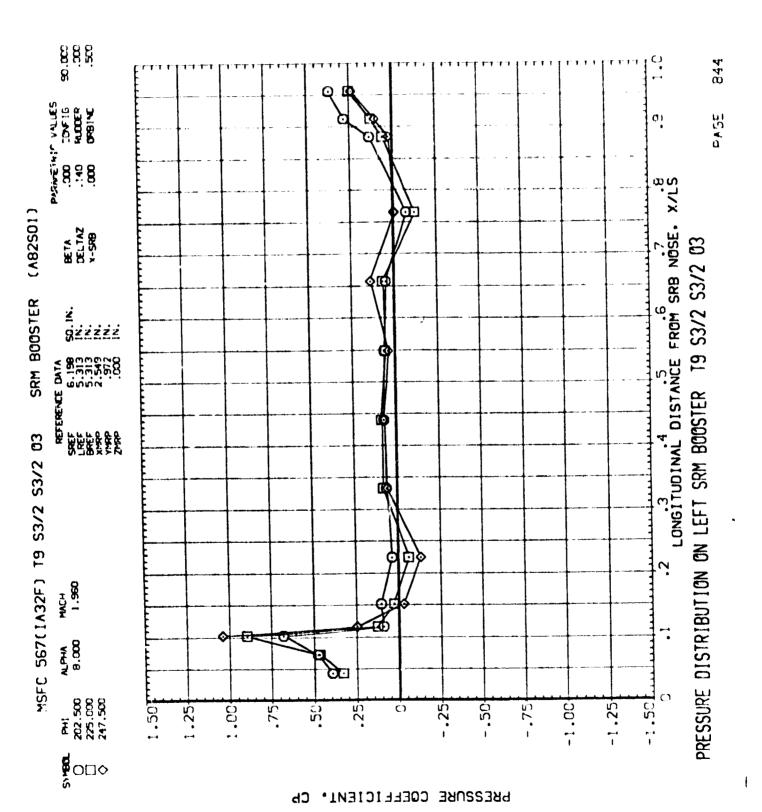
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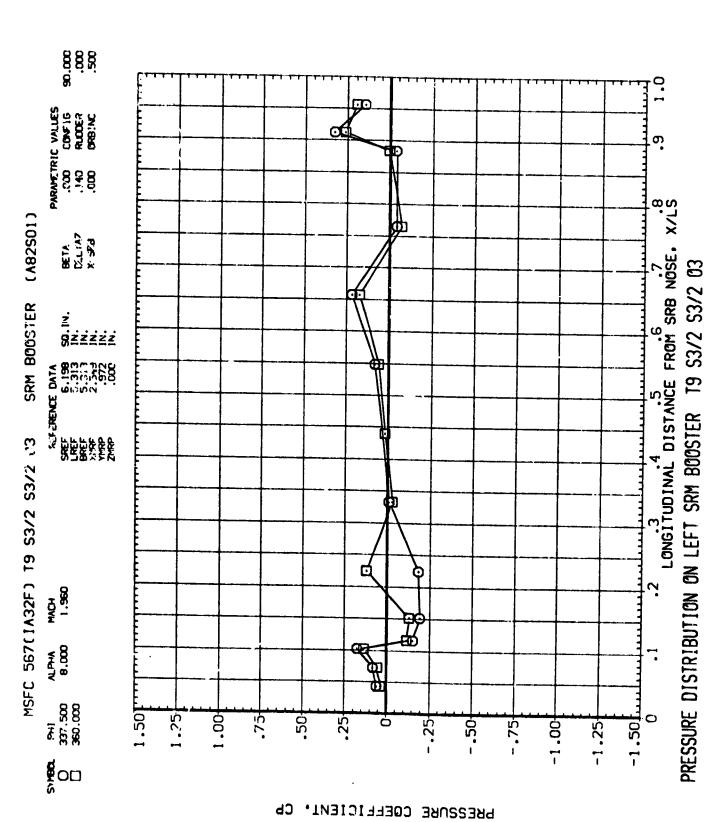
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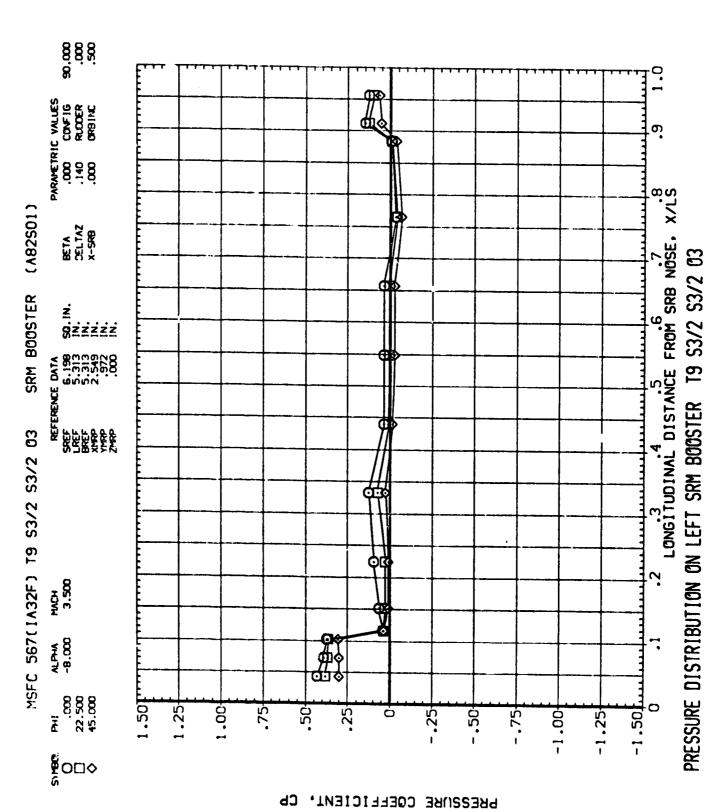
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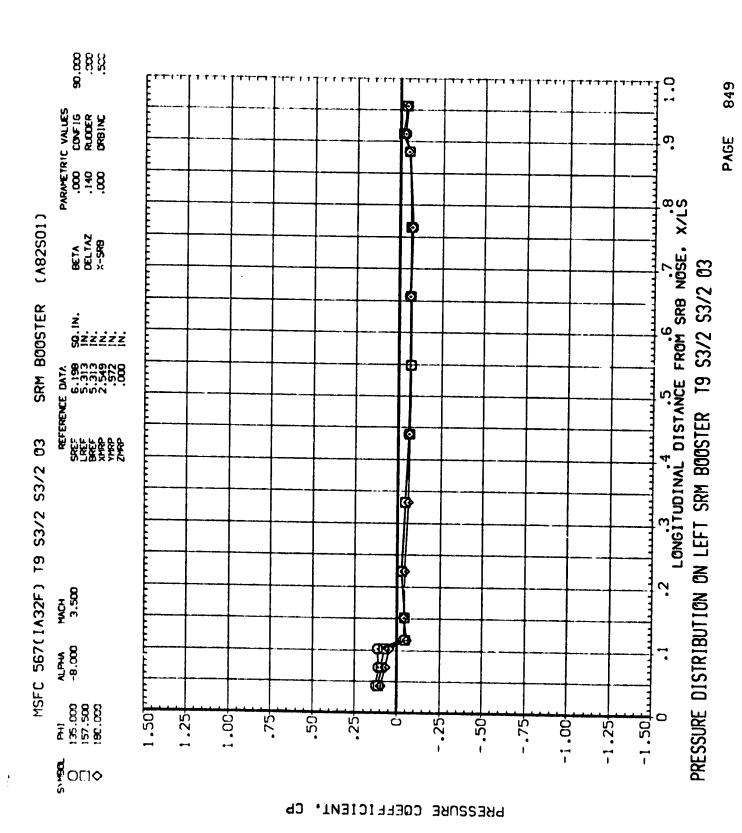
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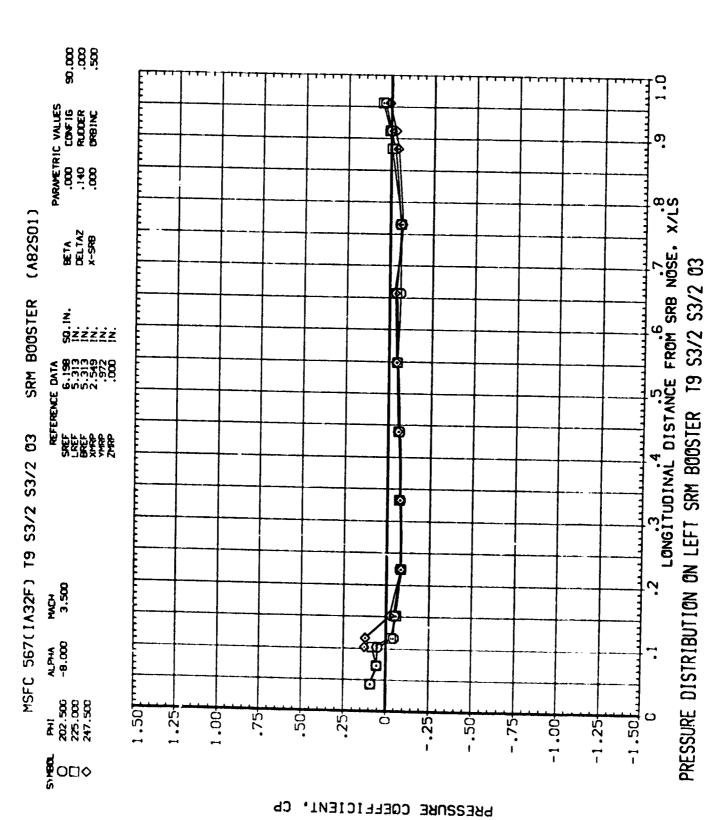
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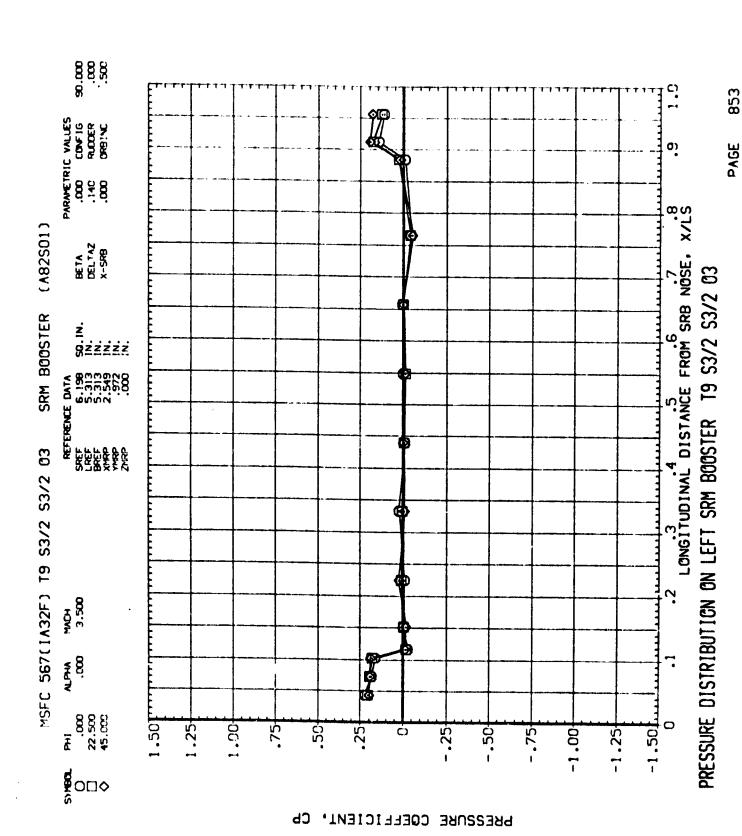


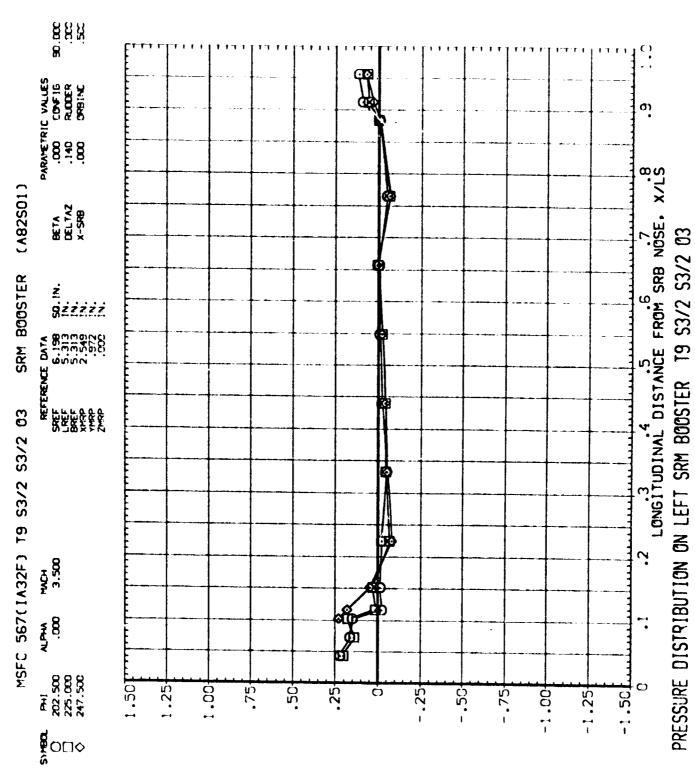


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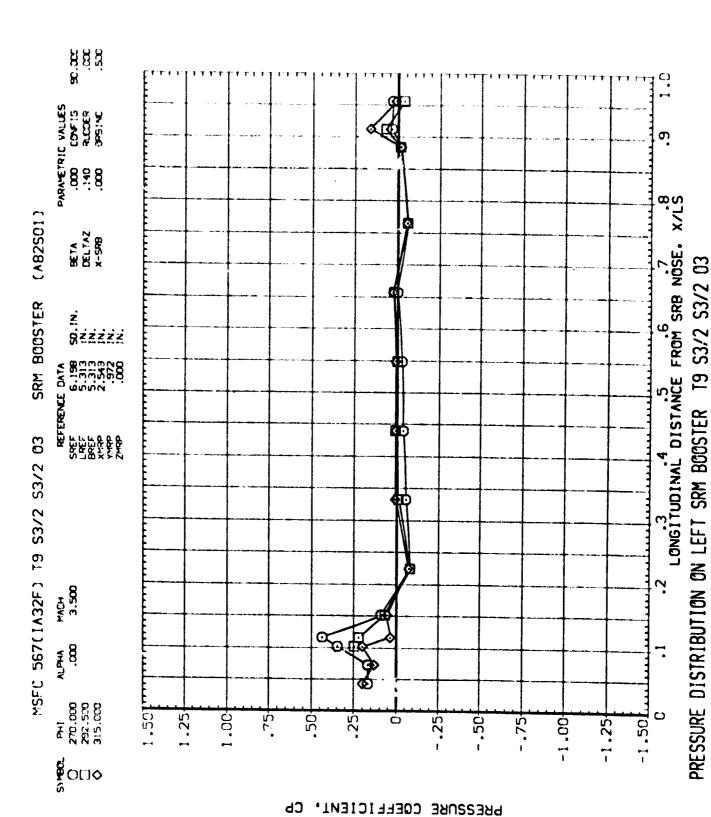
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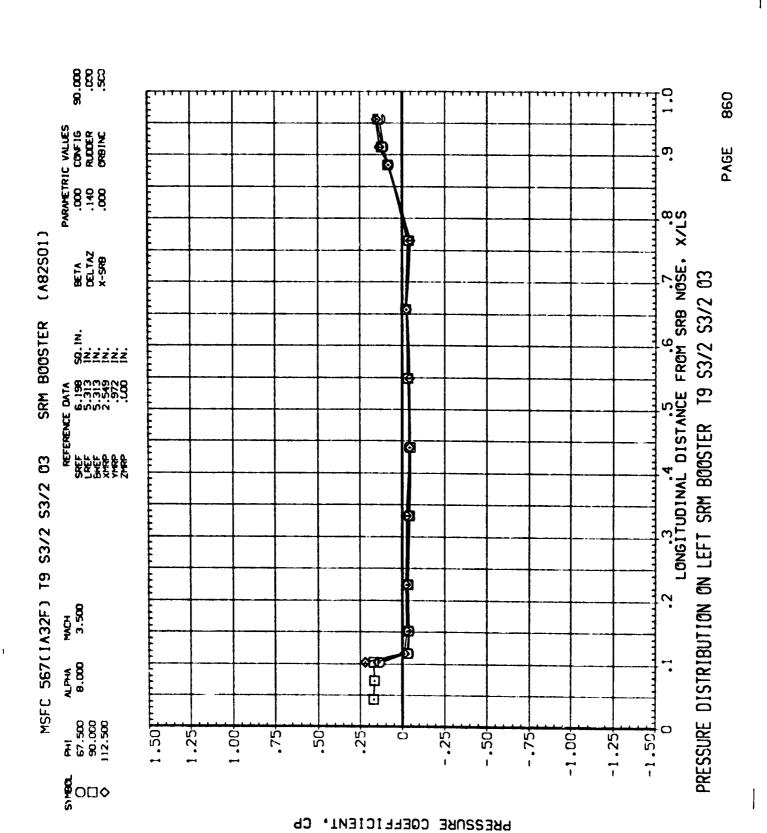


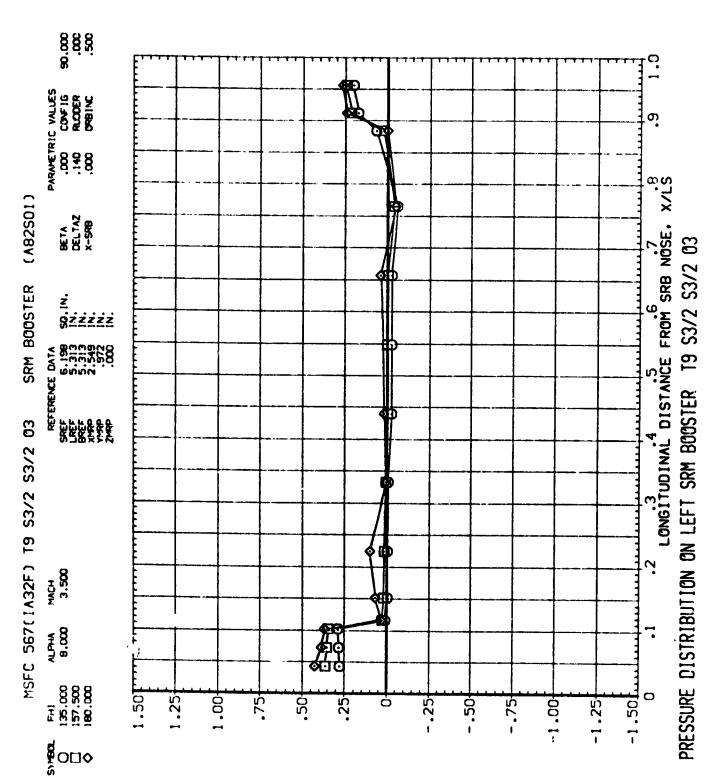
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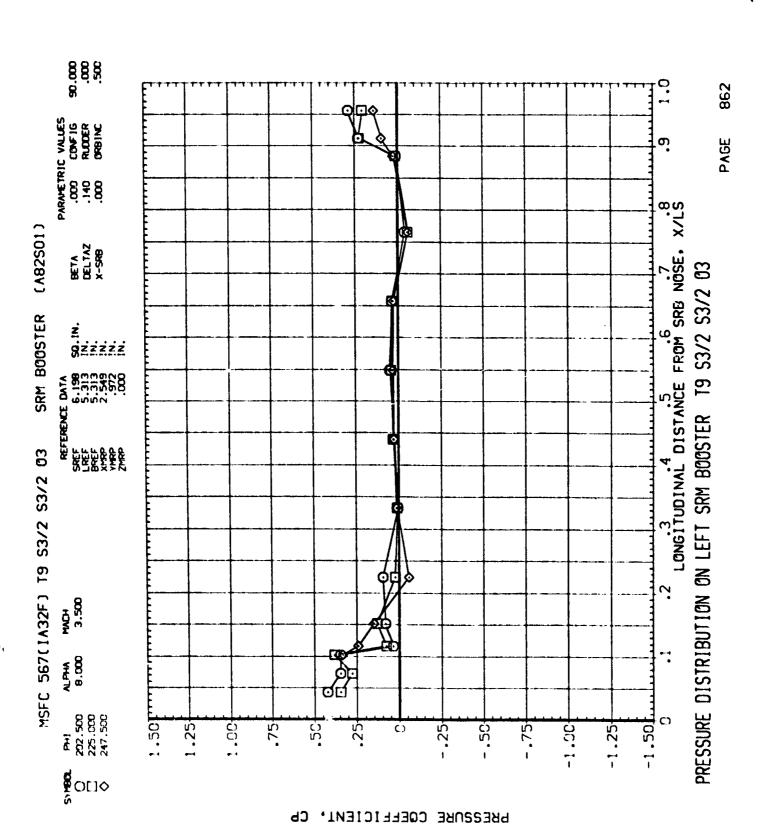
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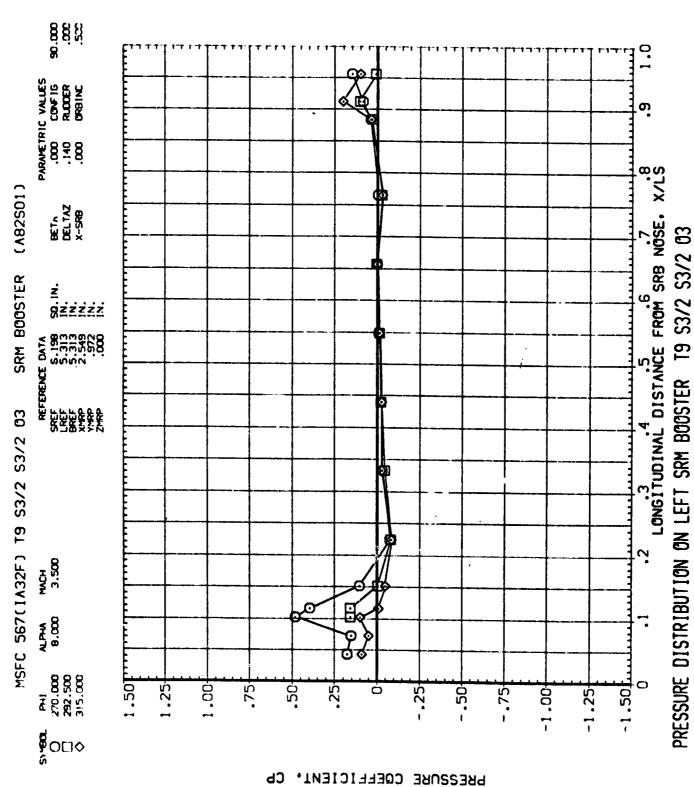
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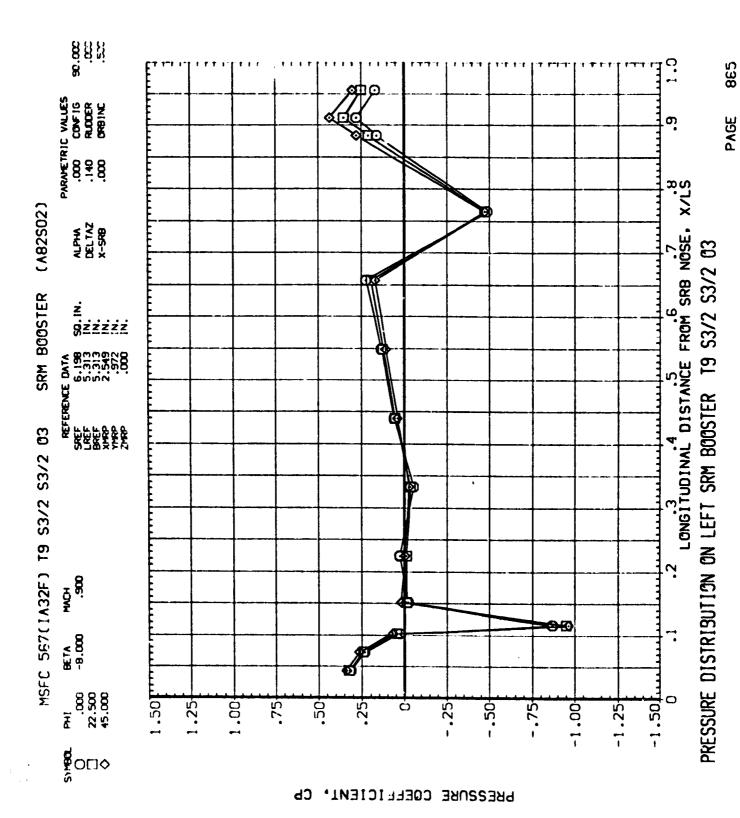


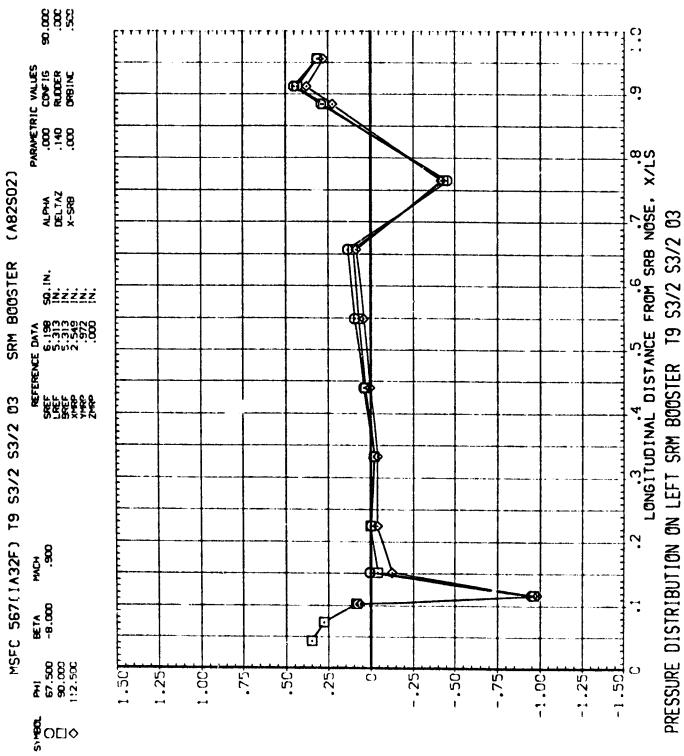


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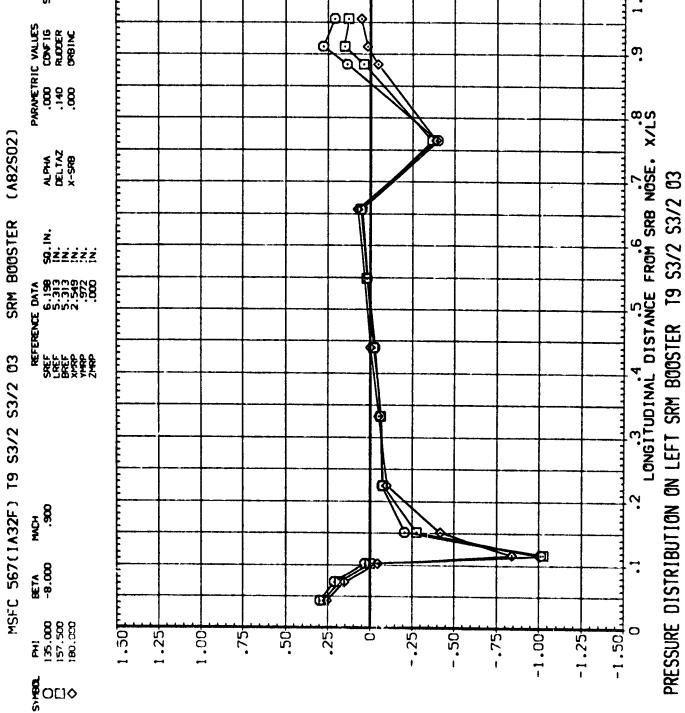




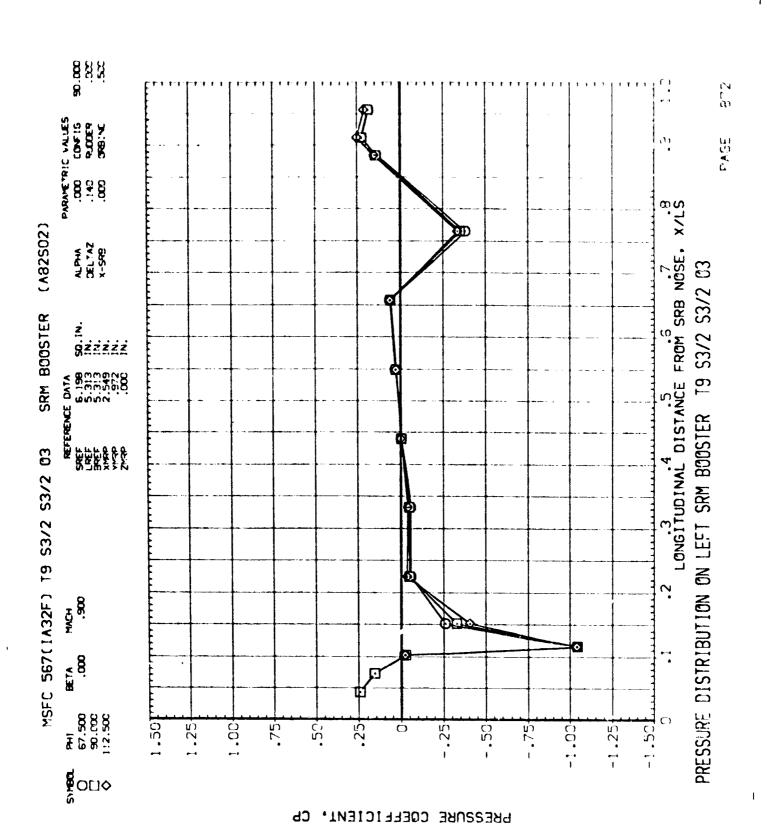


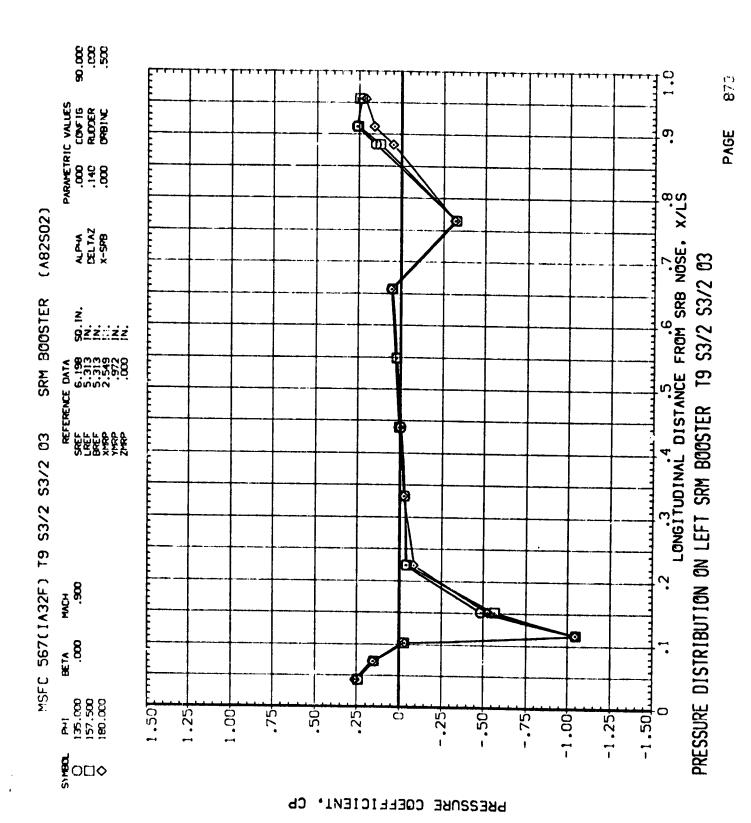
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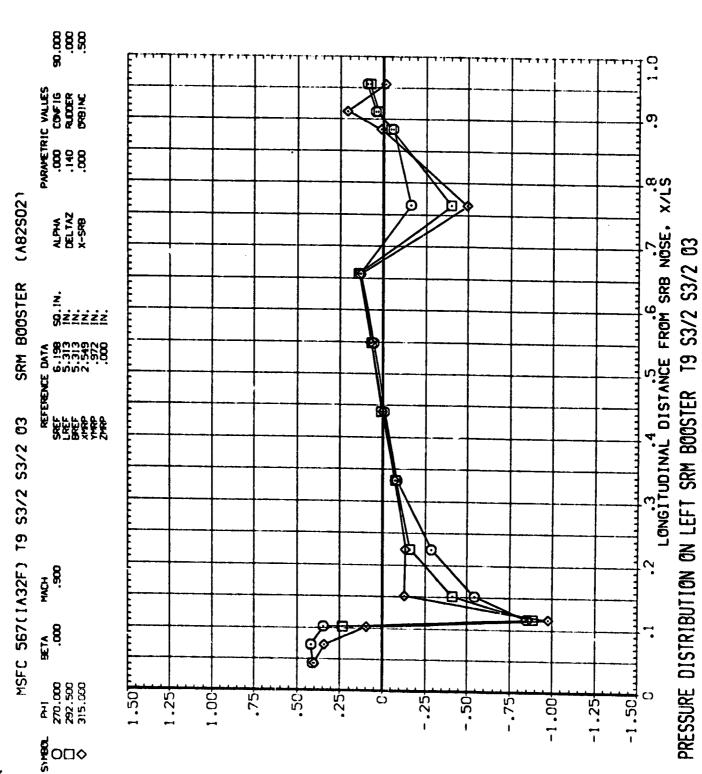
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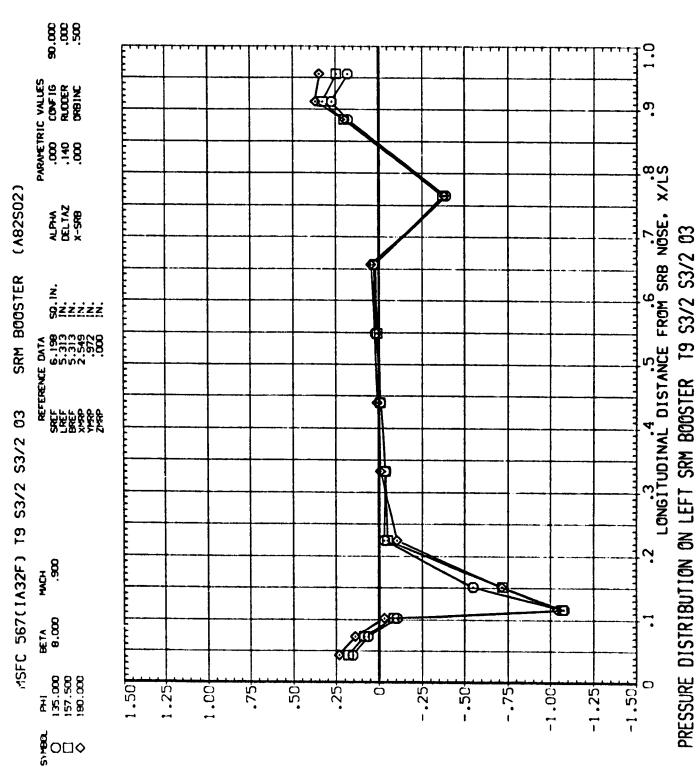


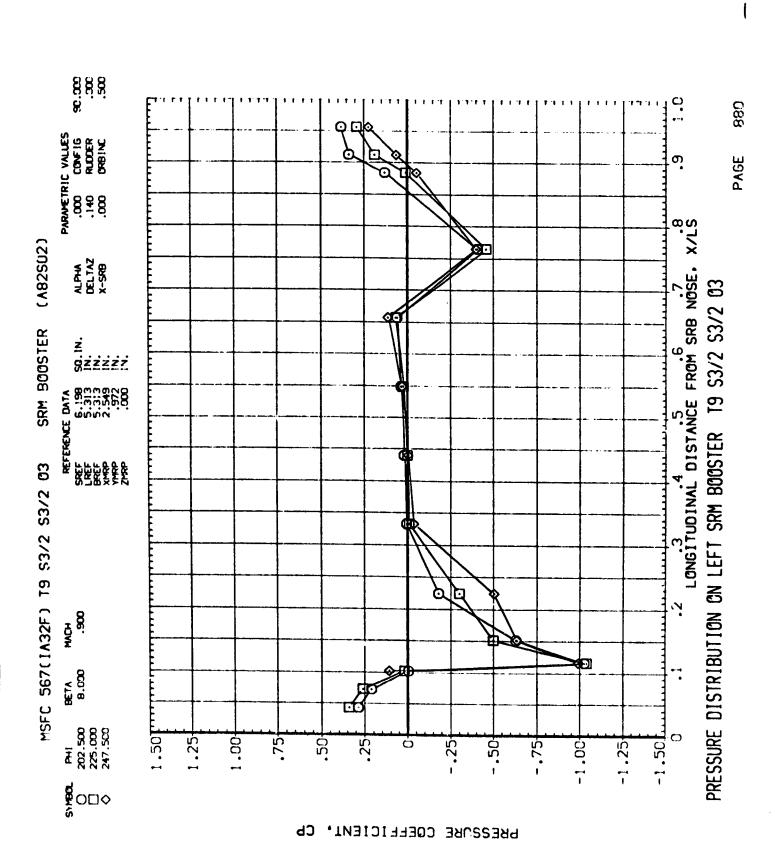
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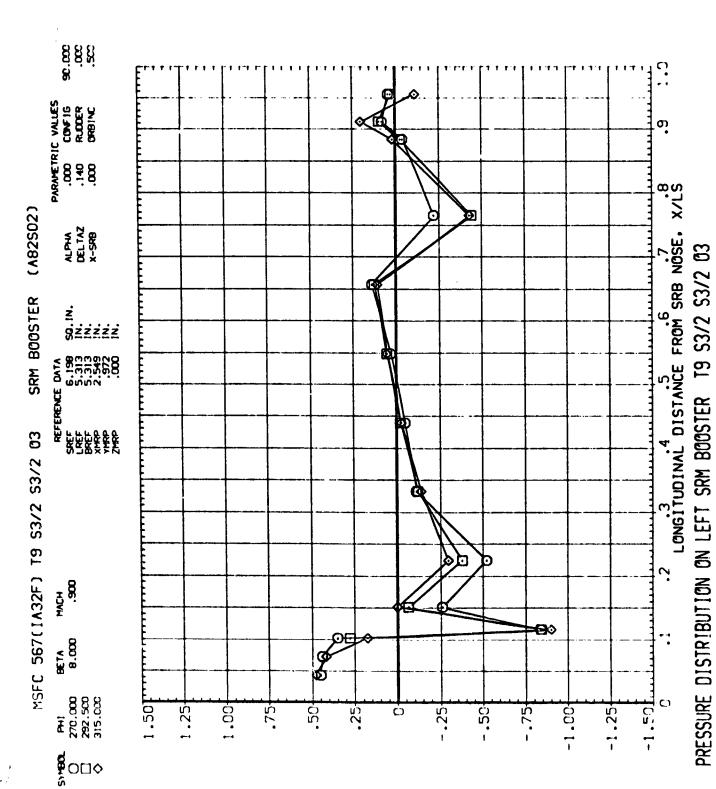
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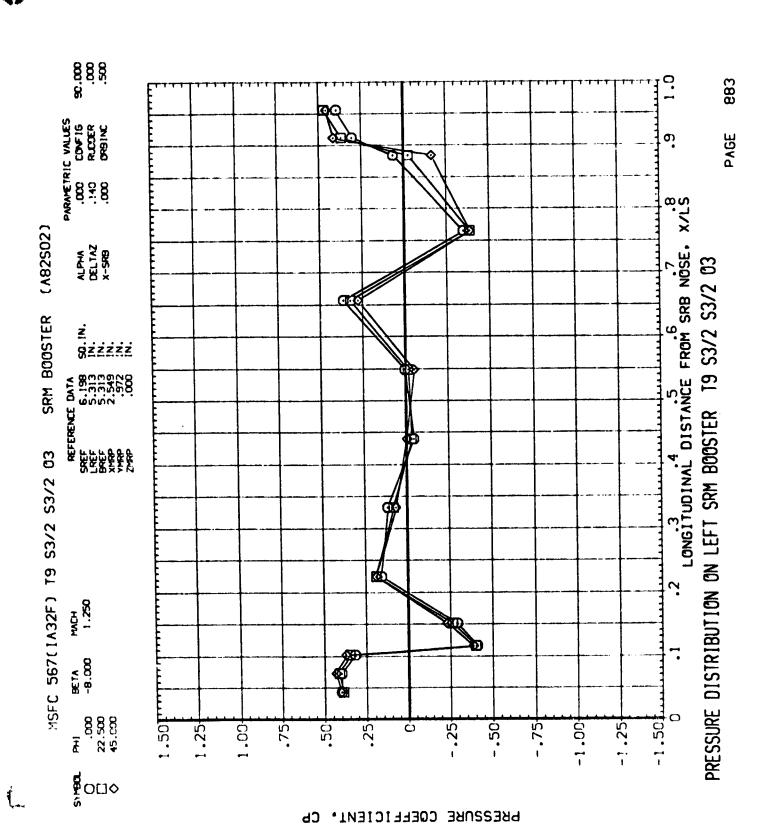
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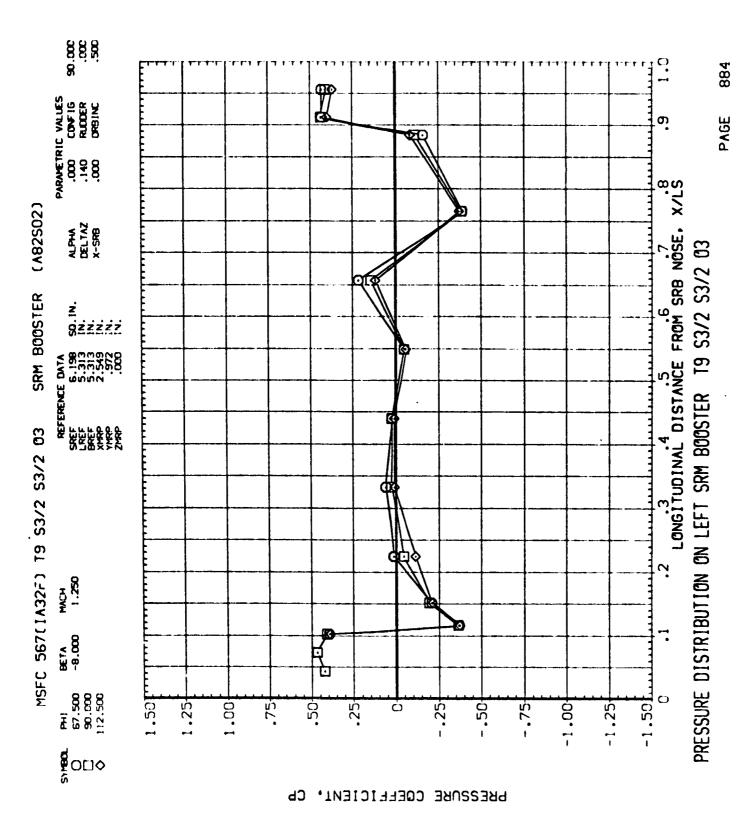






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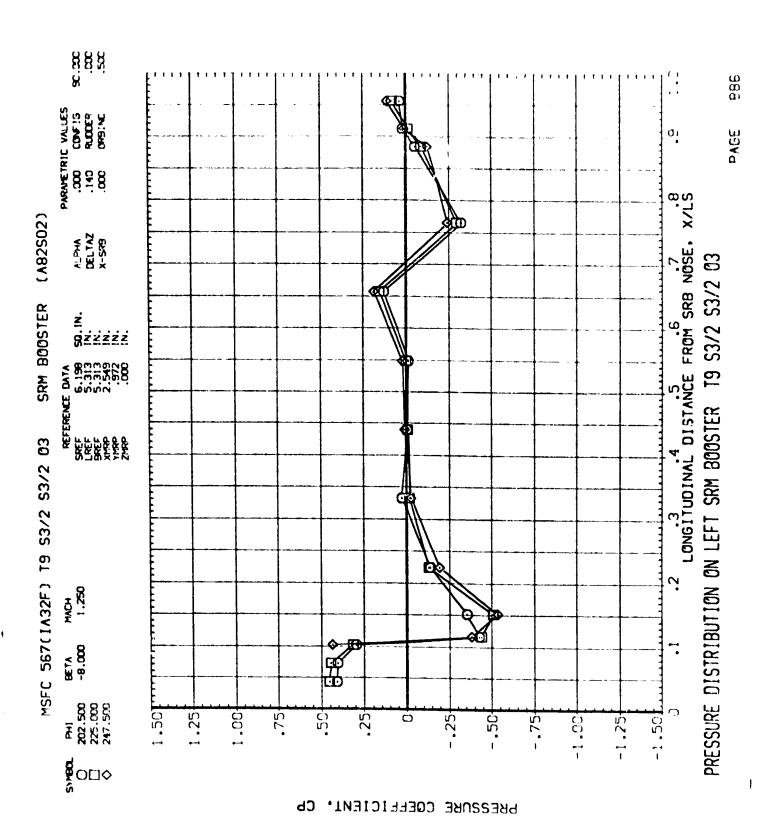




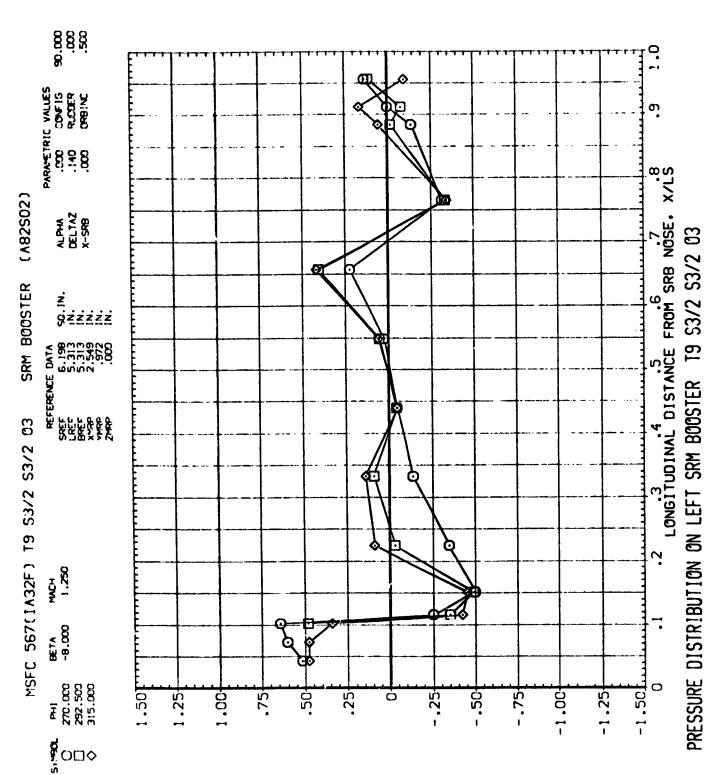
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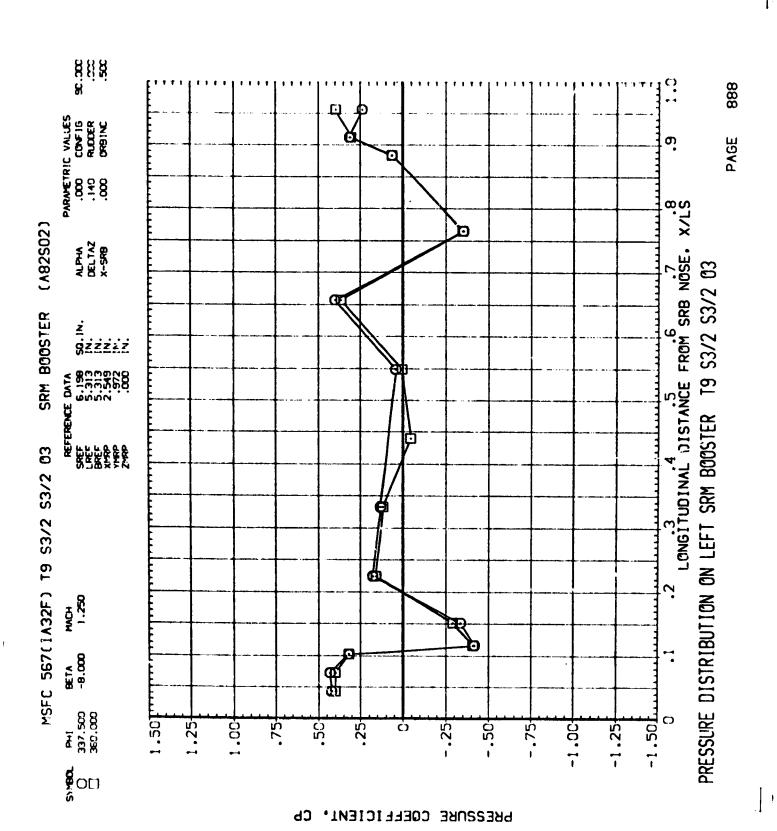
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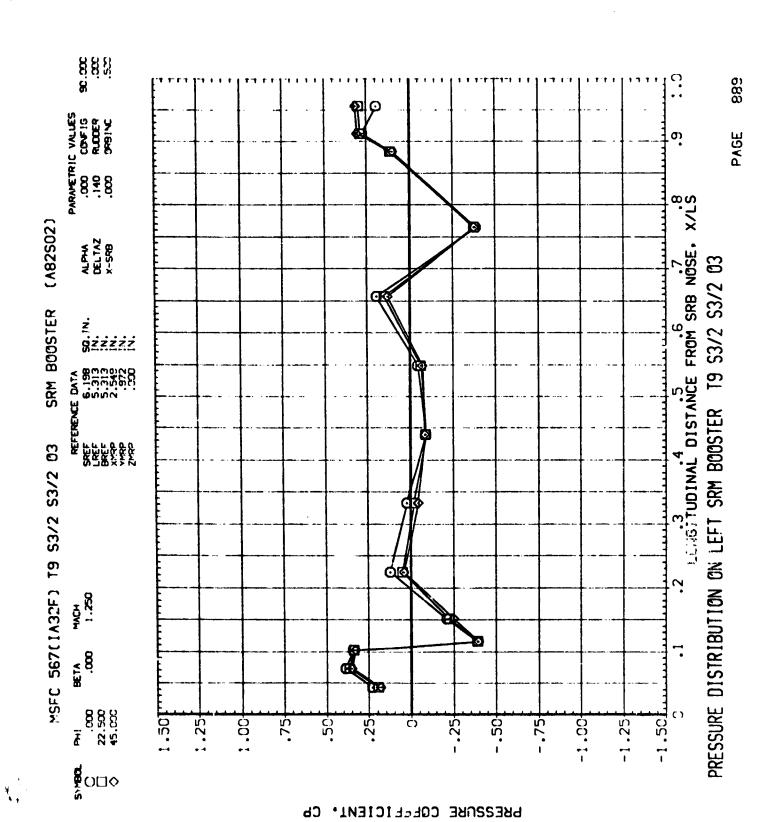


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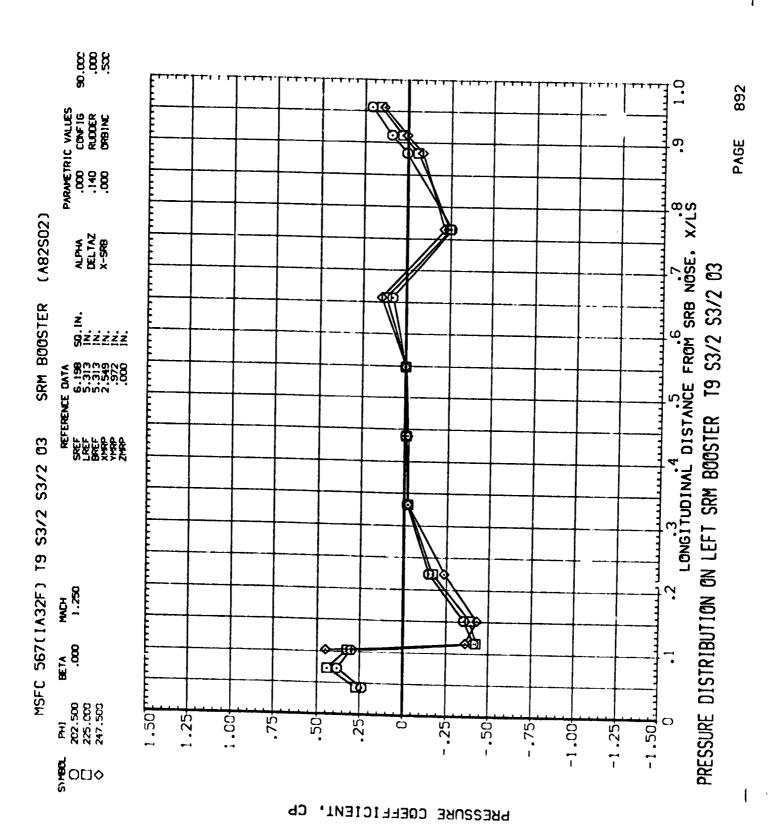
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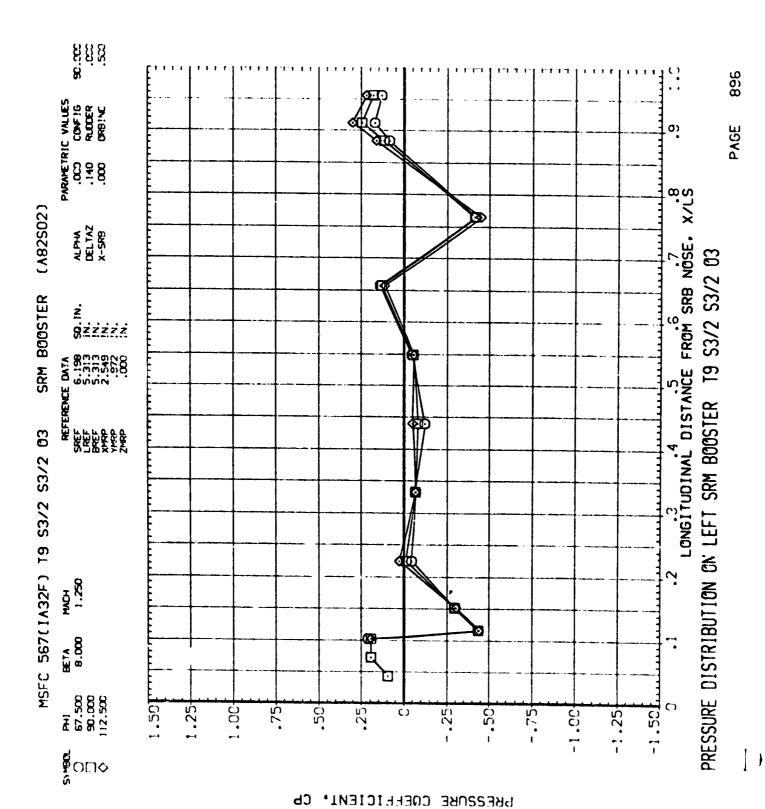


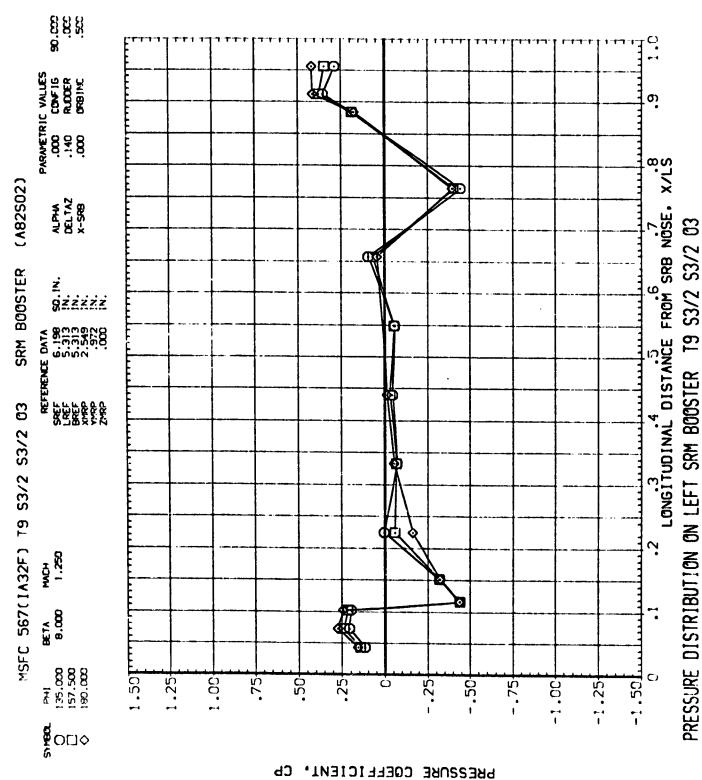
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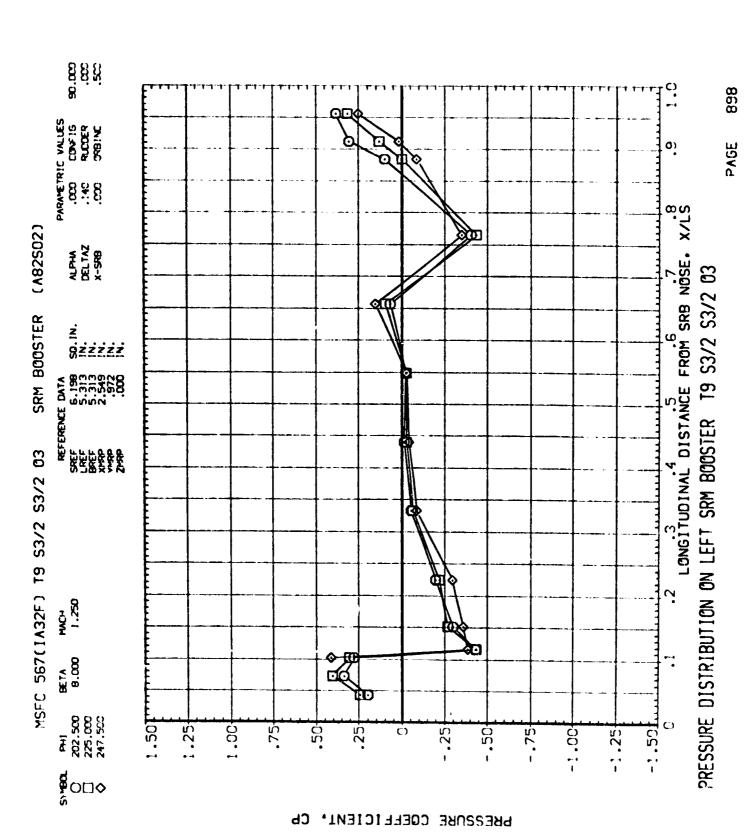
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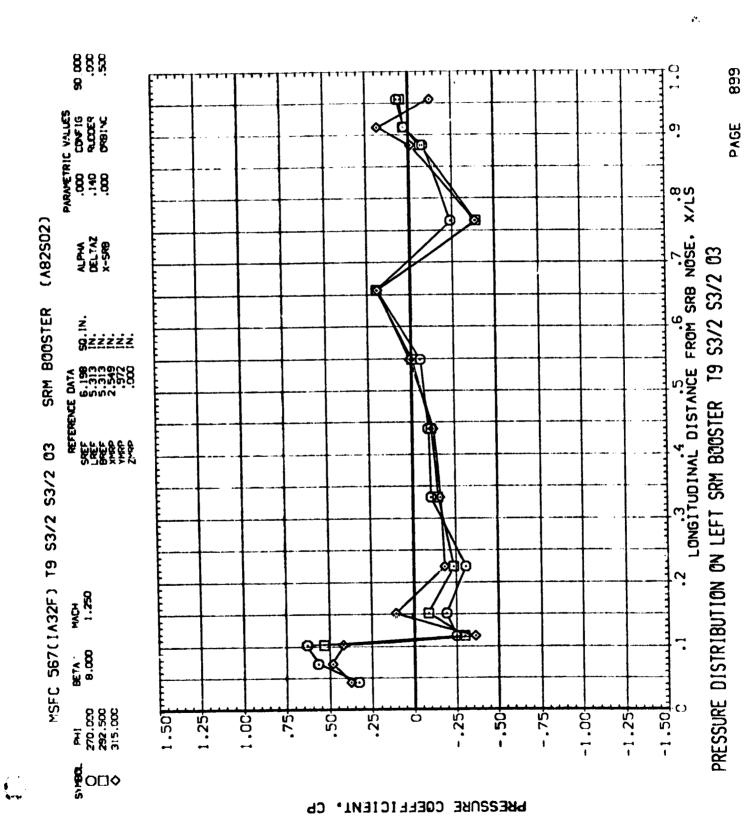
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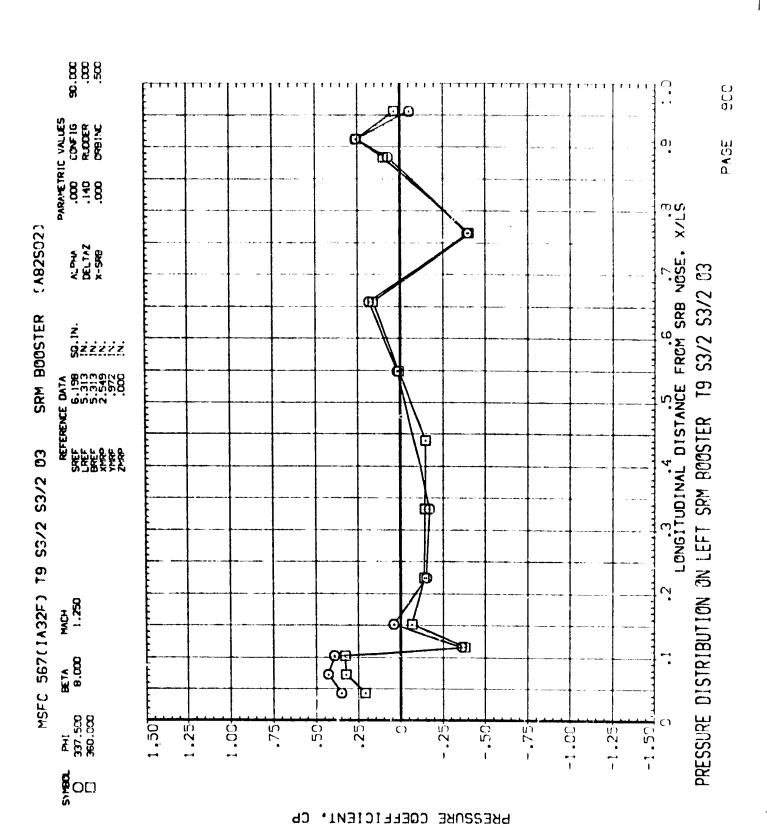


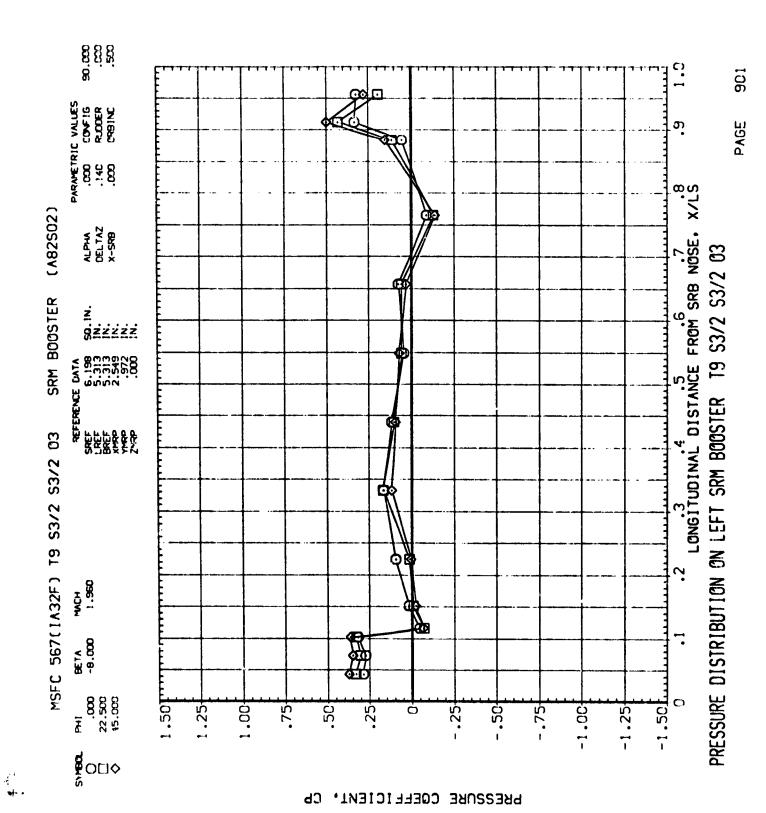


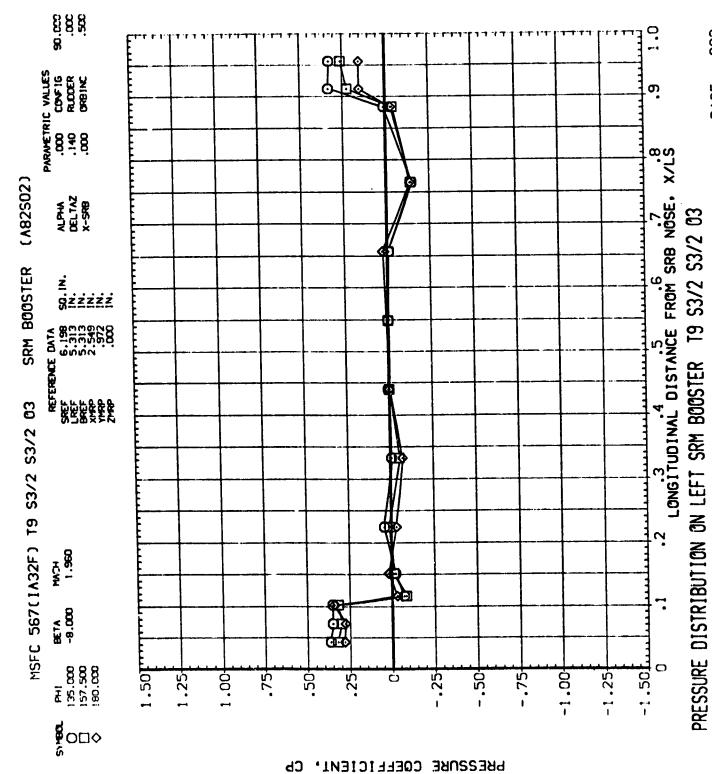




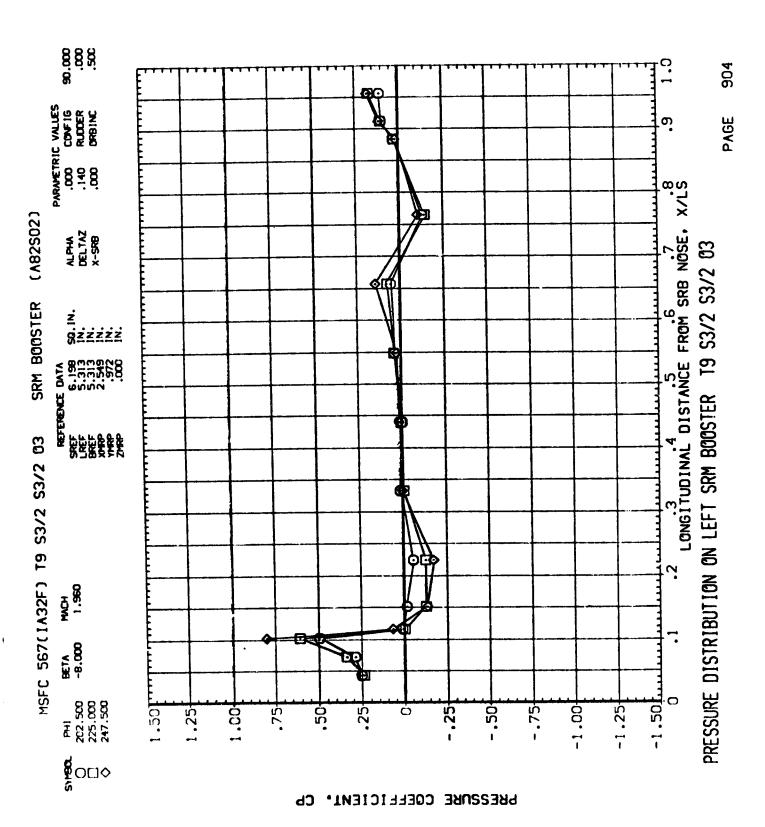
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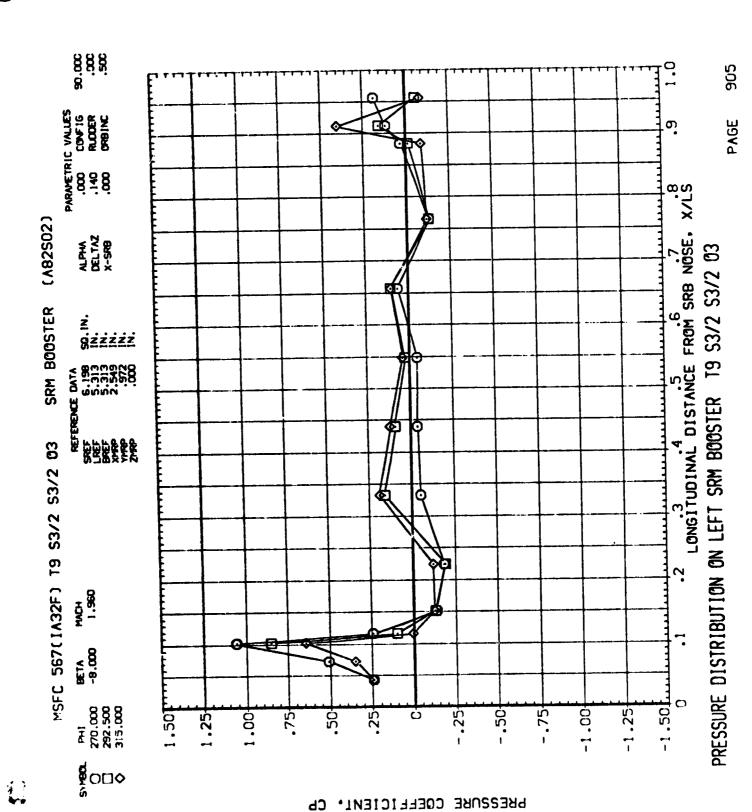


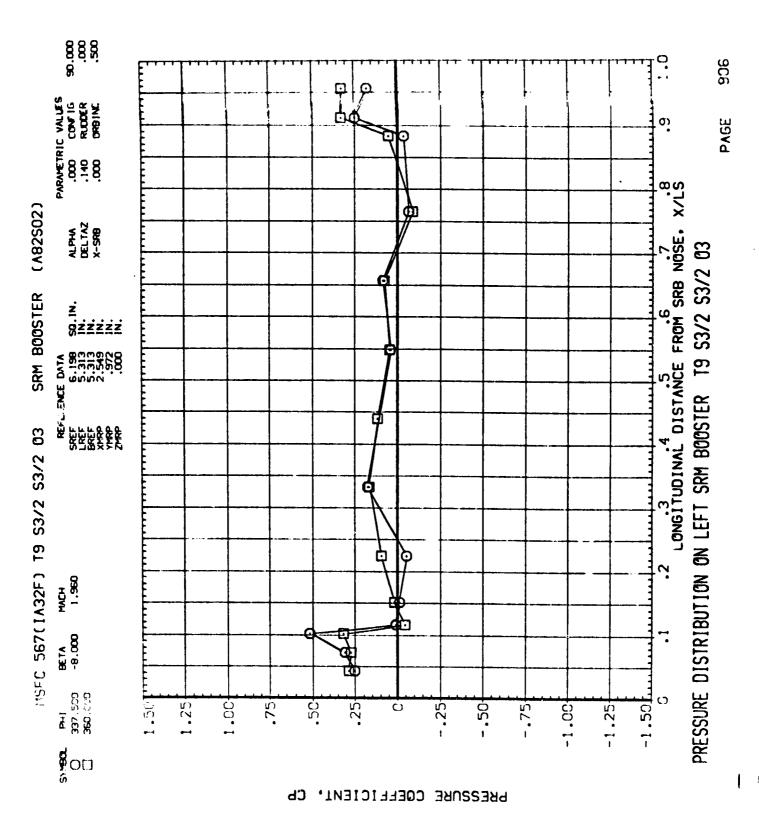


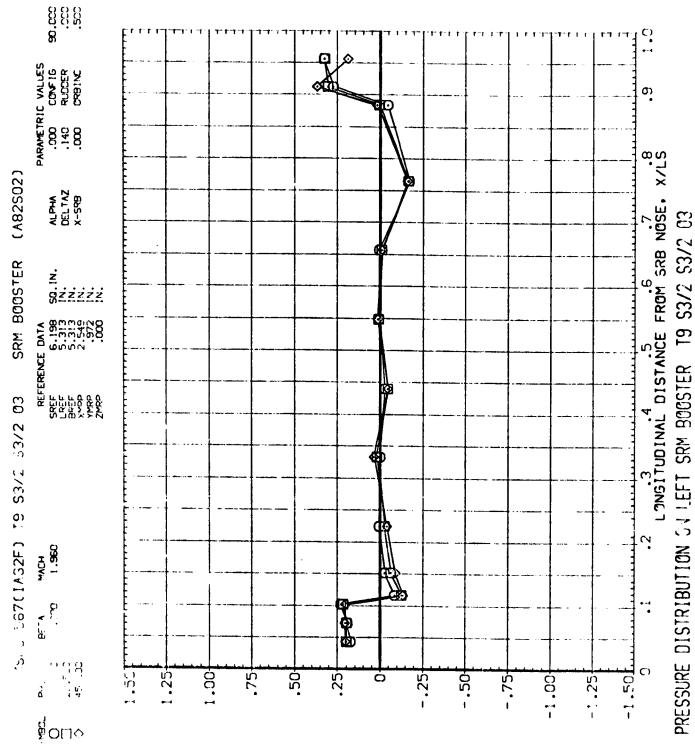


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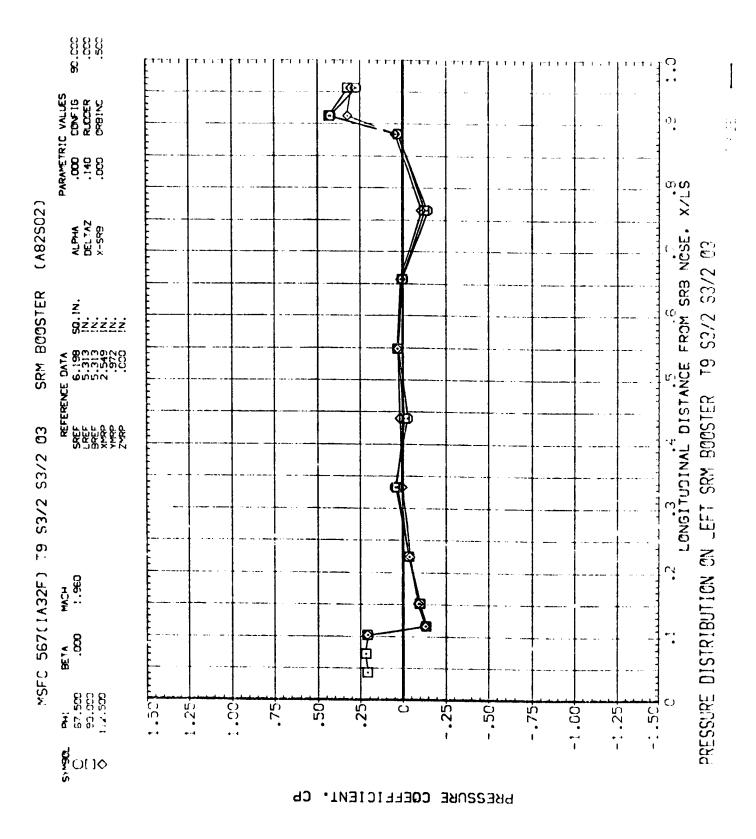


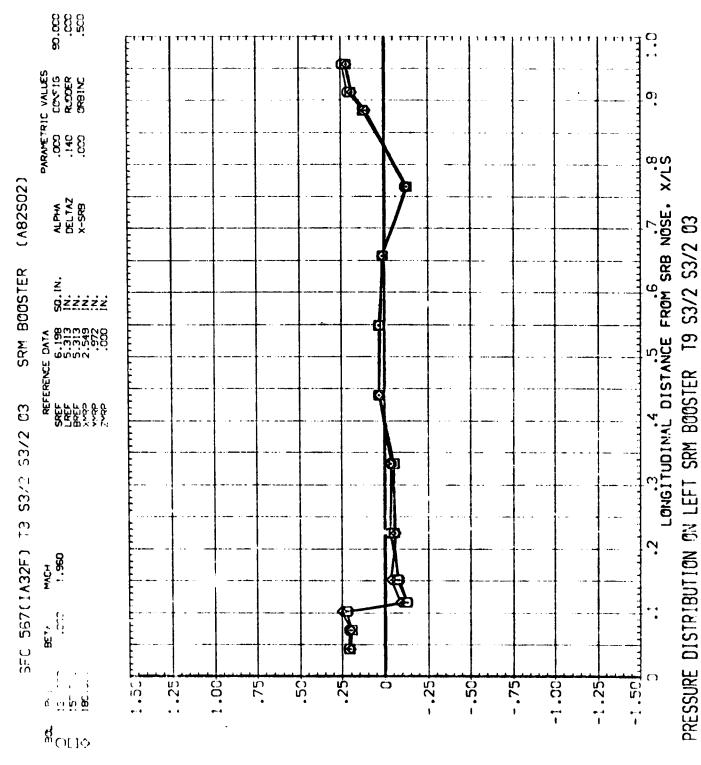




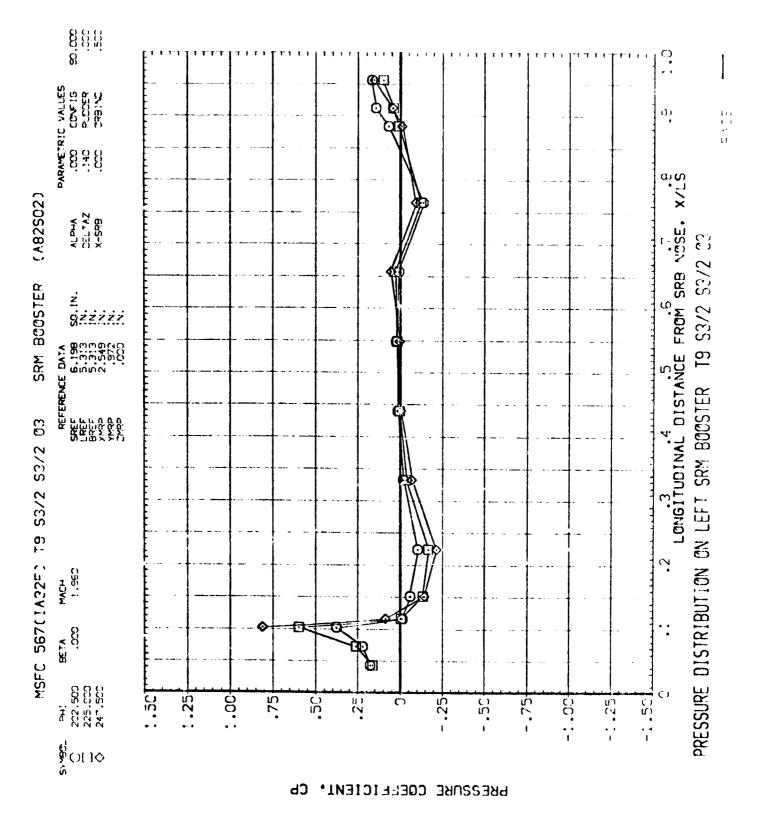


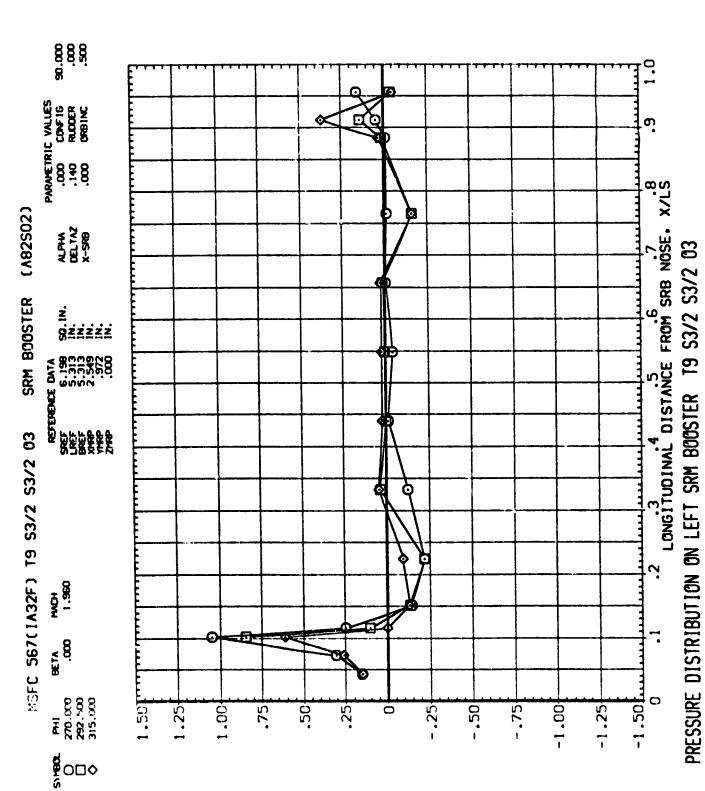
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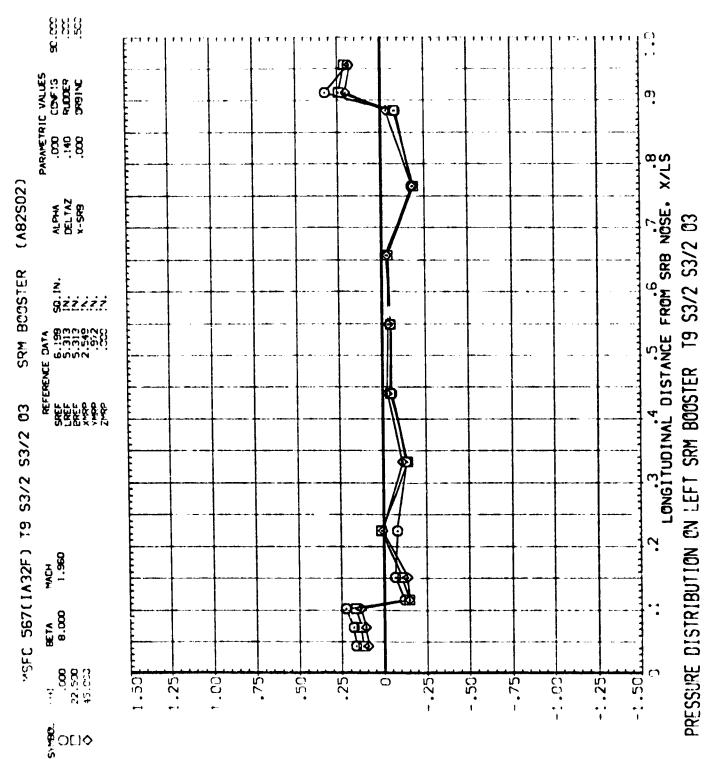




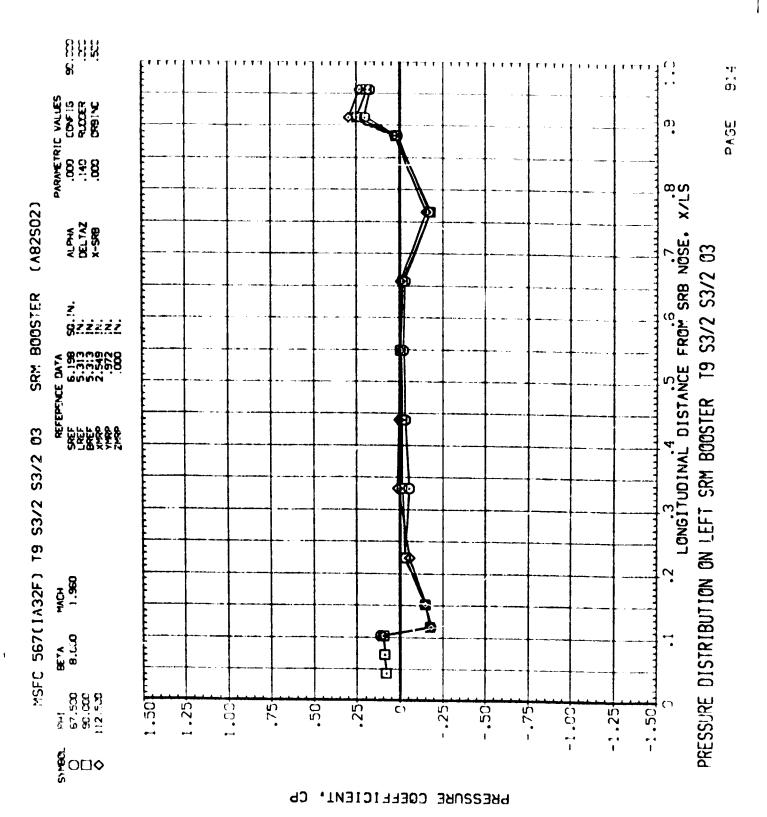
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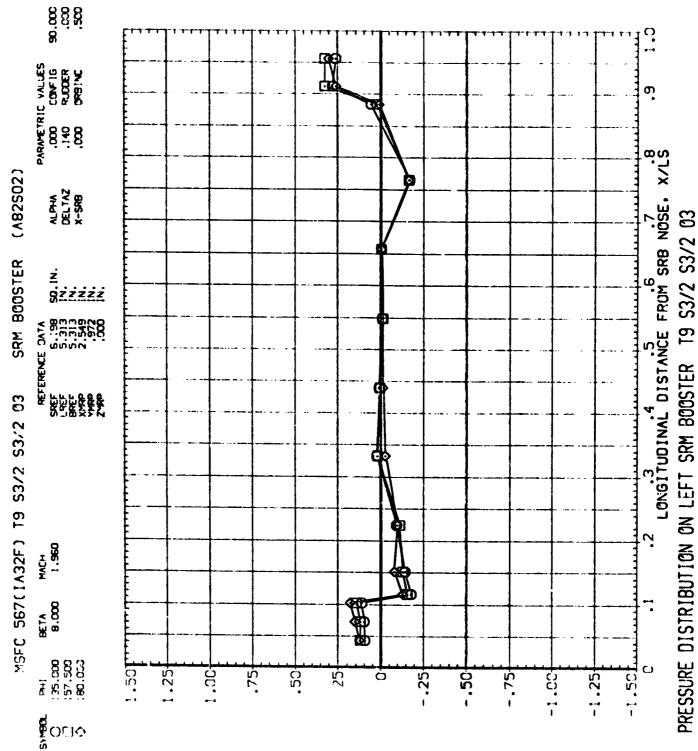




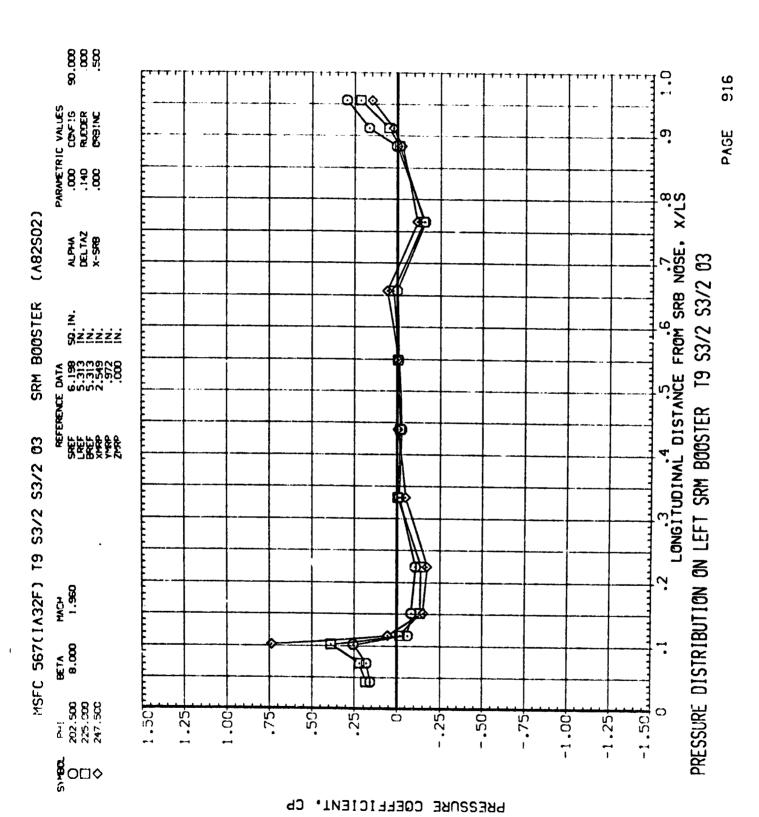


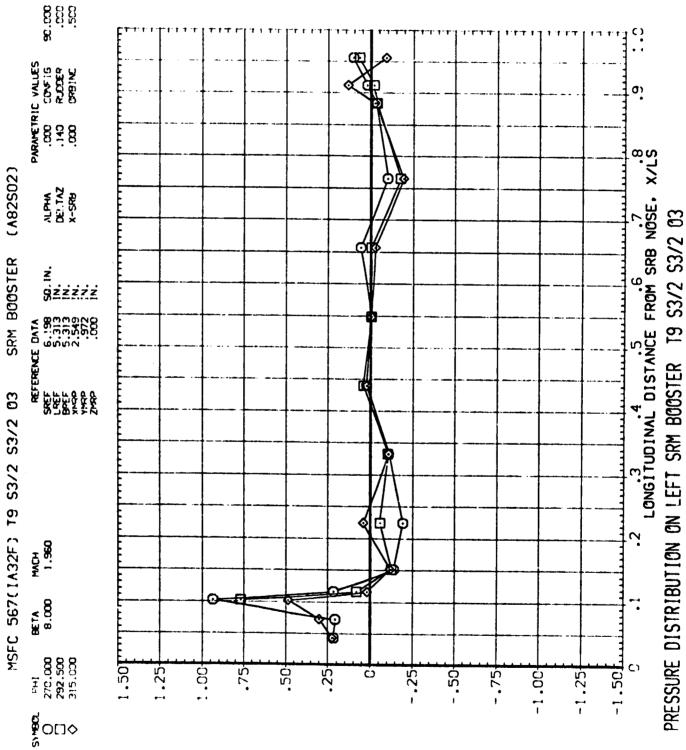
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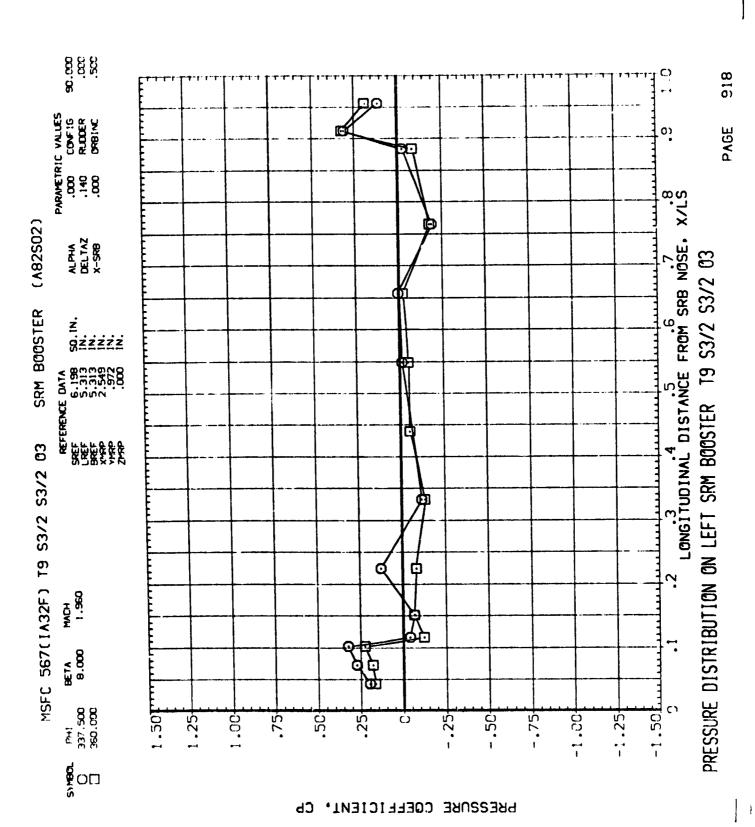


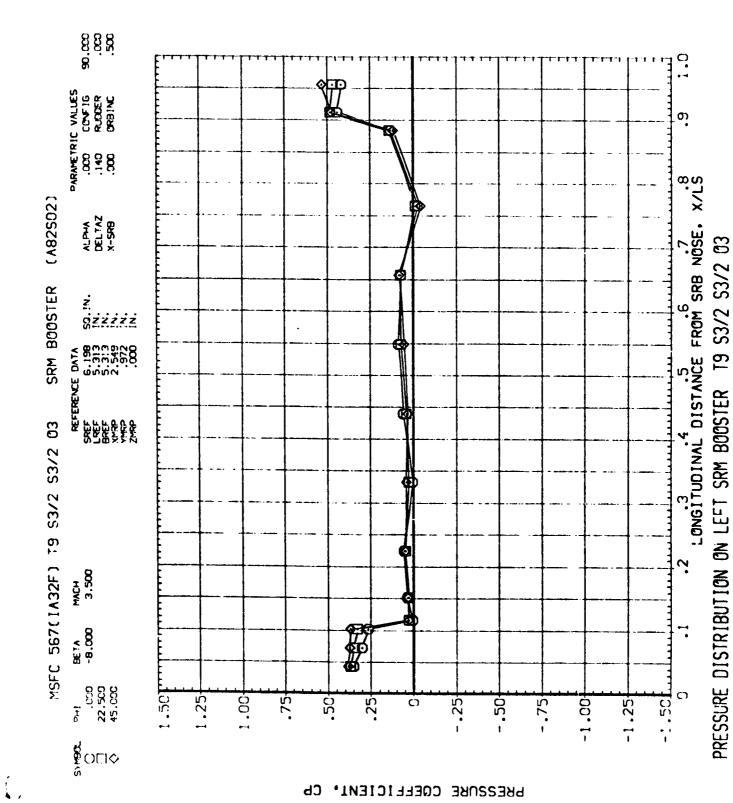
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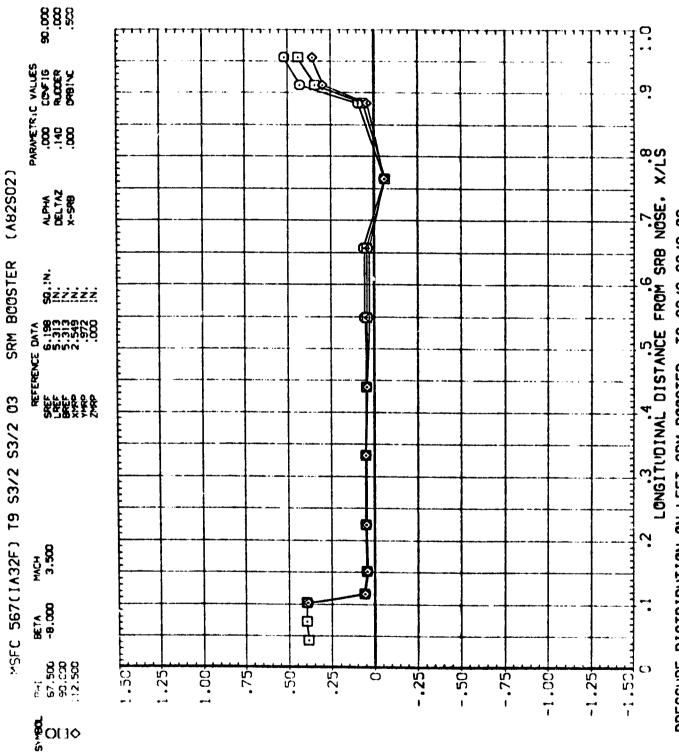




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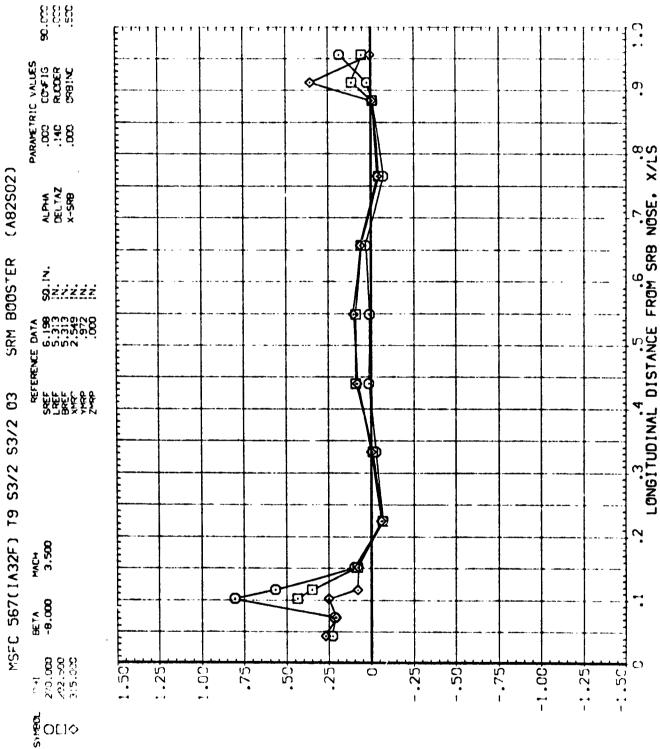


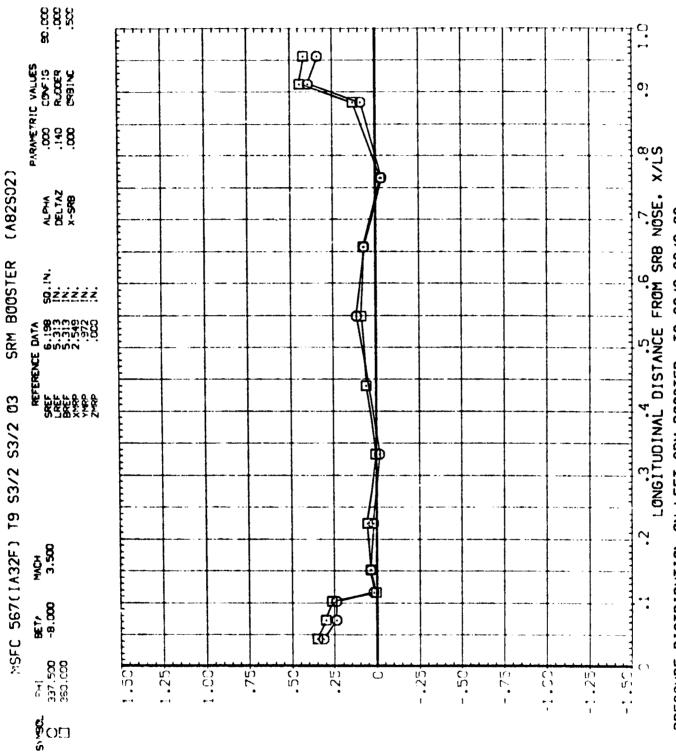


PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER 19 S3/2 S3/2 03

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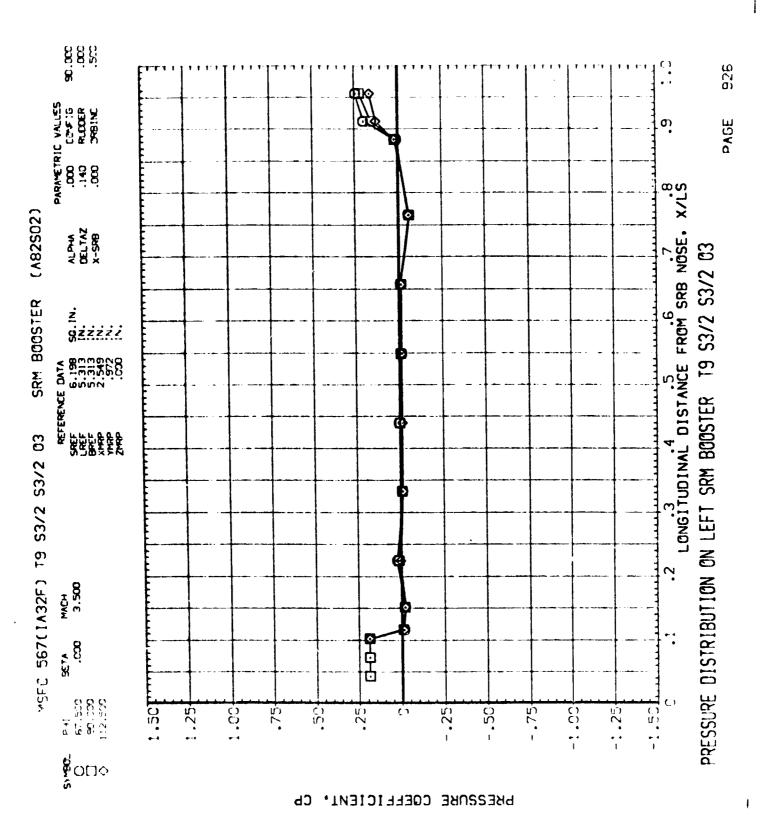
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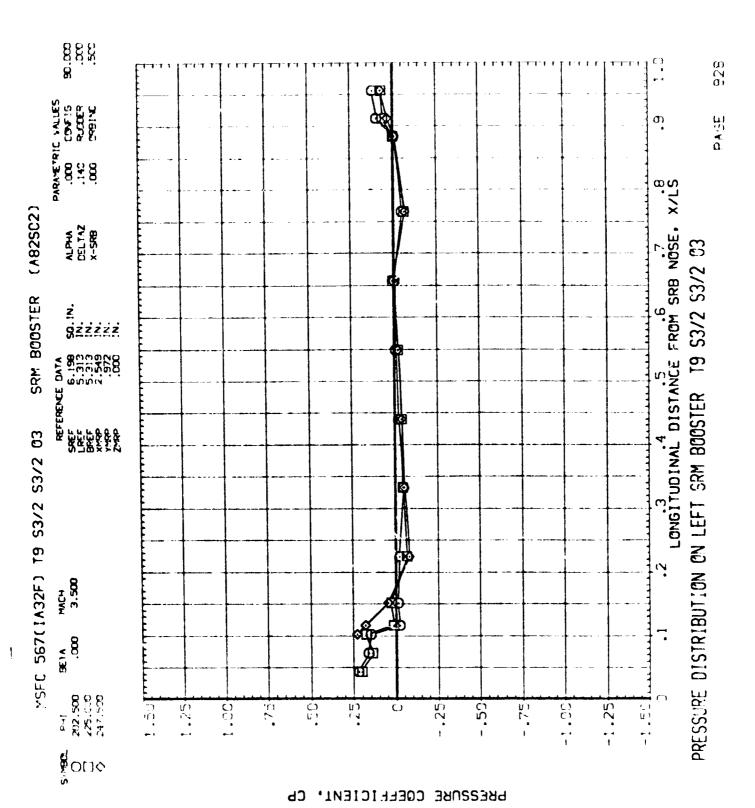


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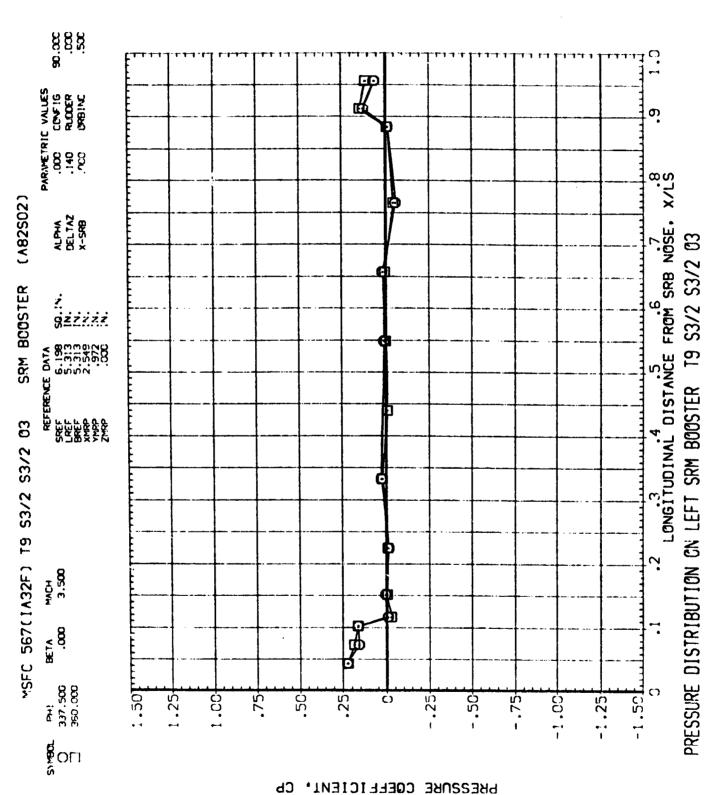
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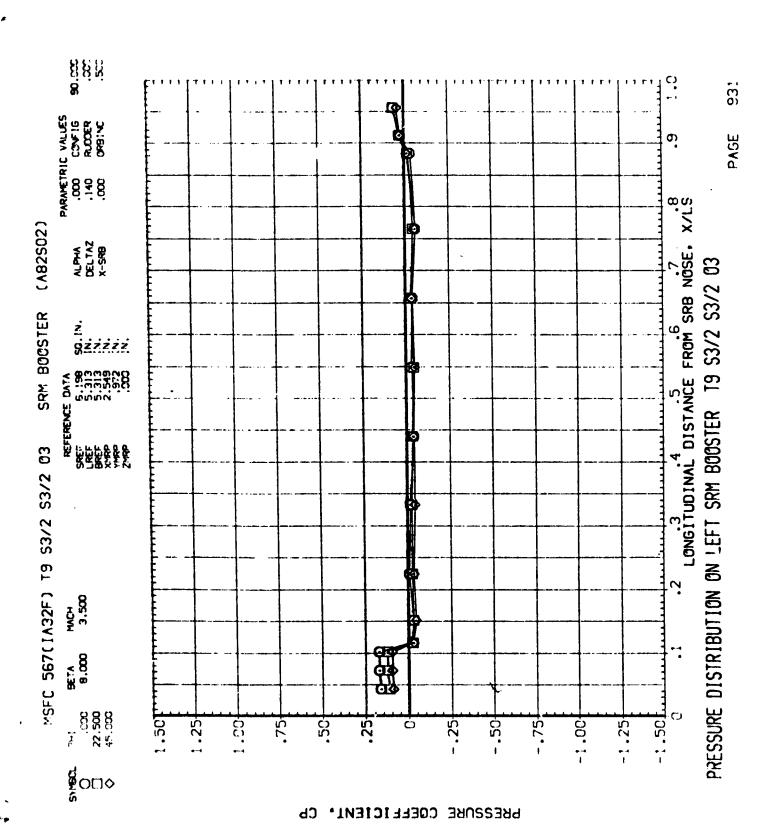


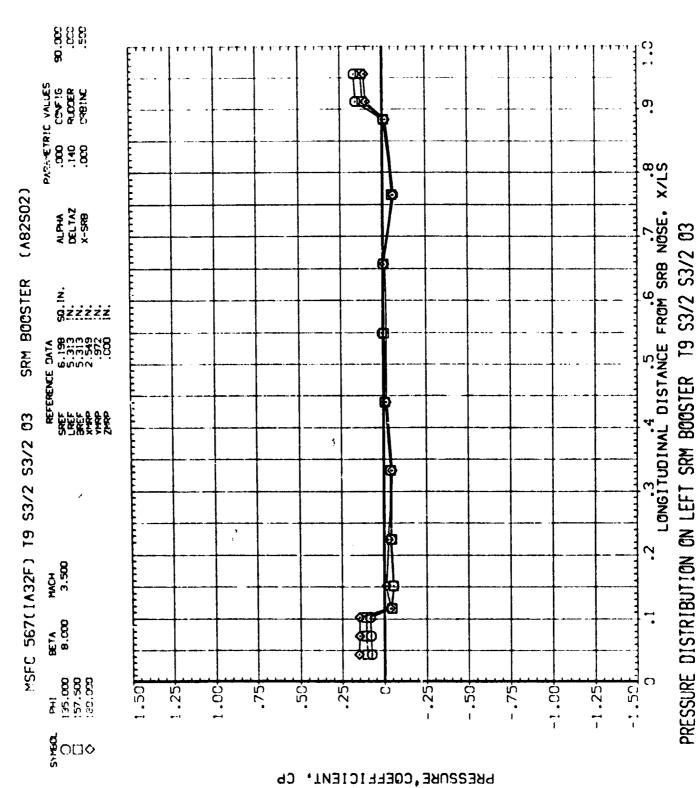
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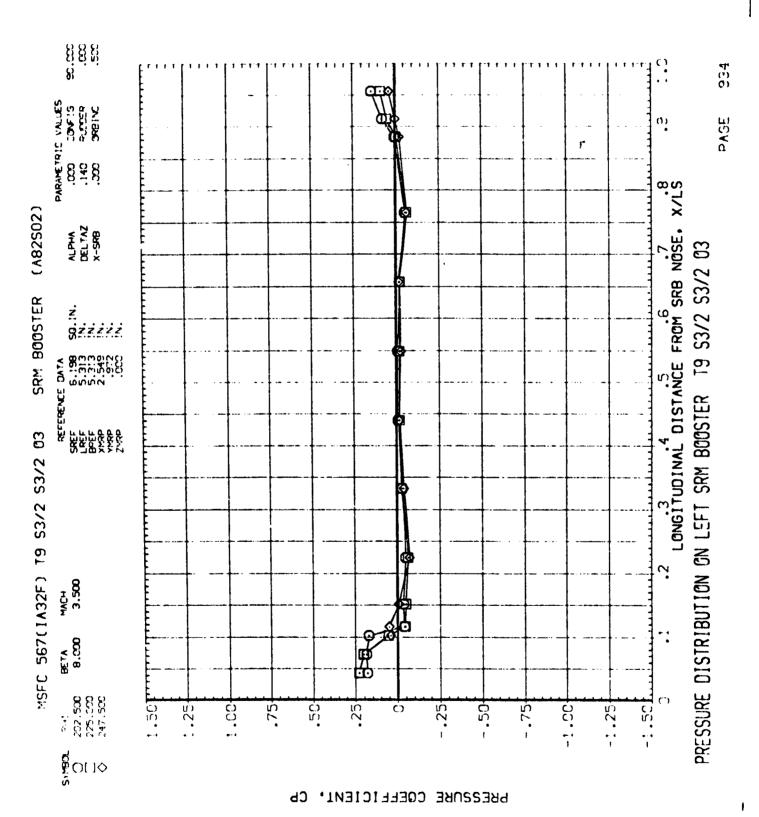
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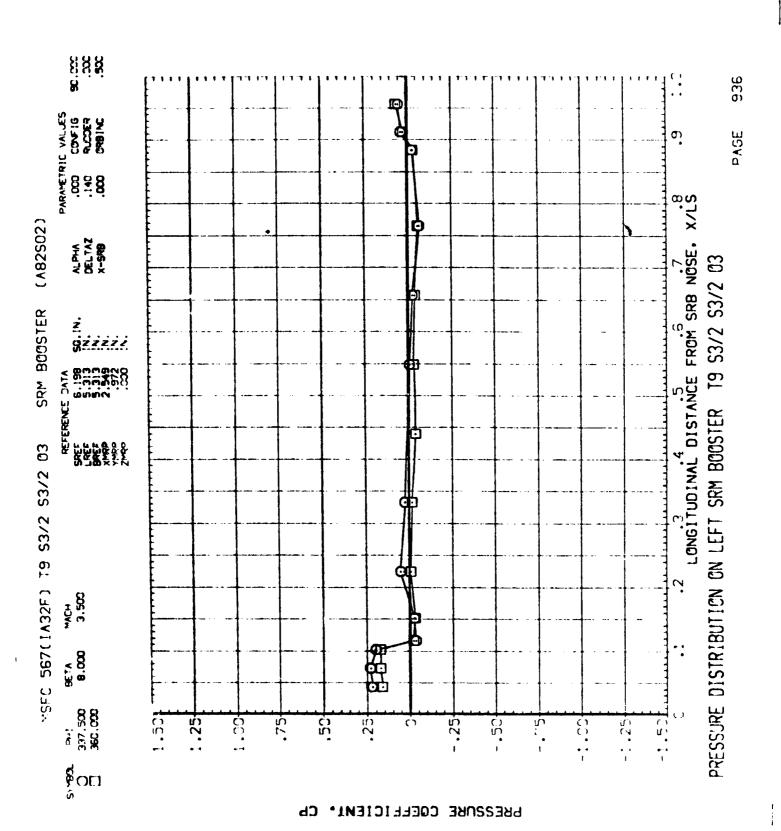


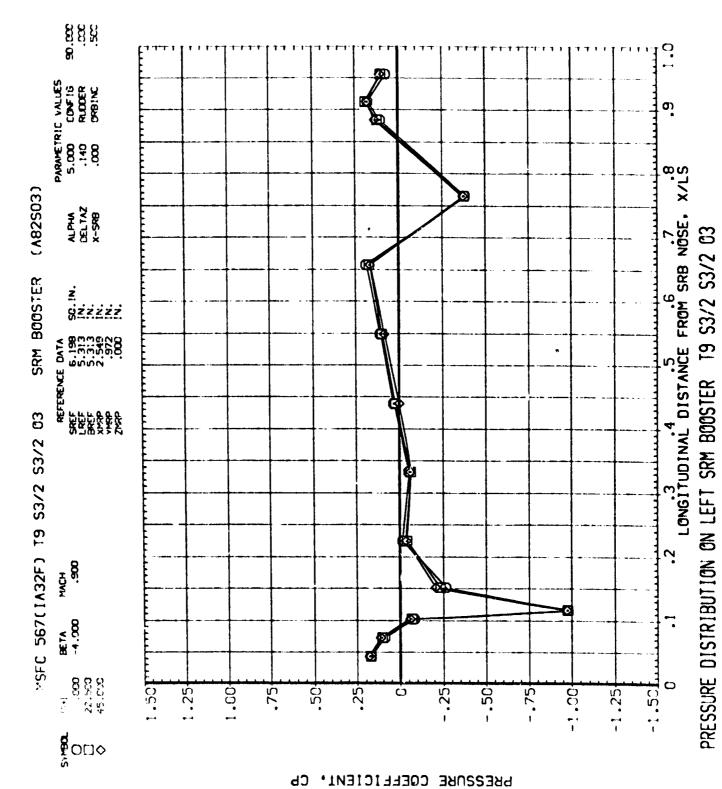


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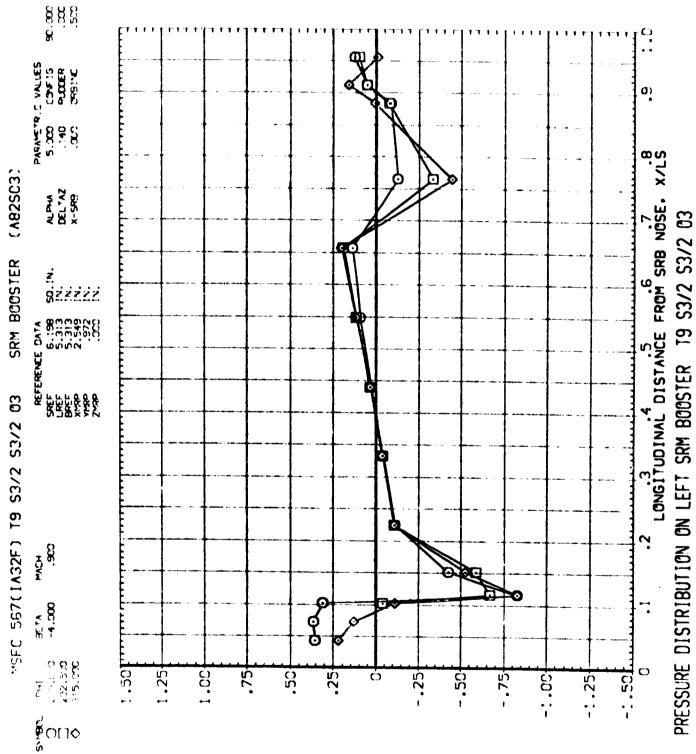


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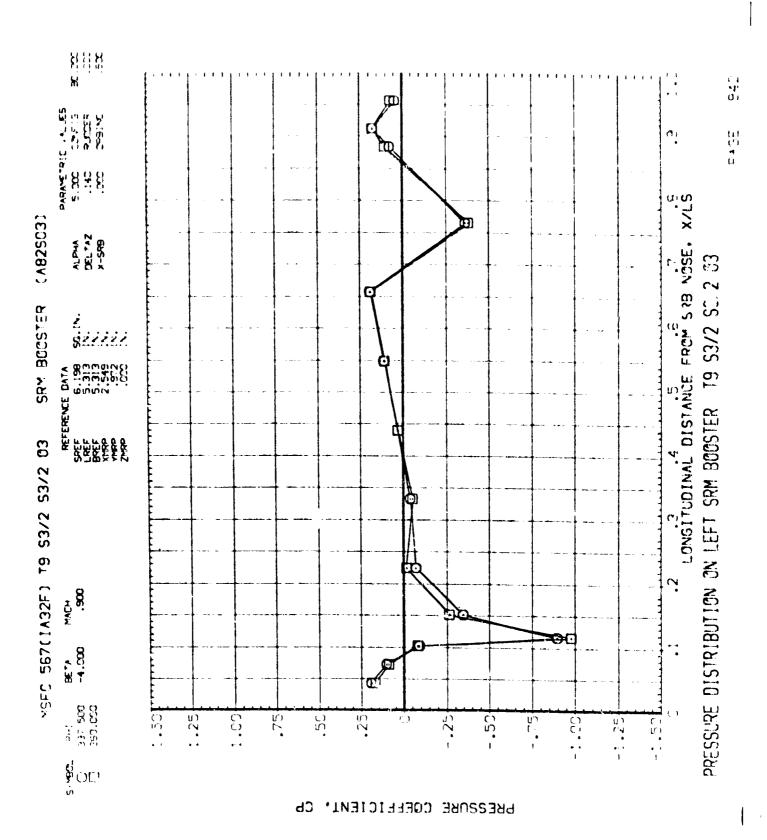
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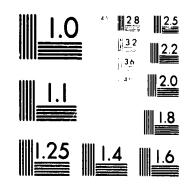
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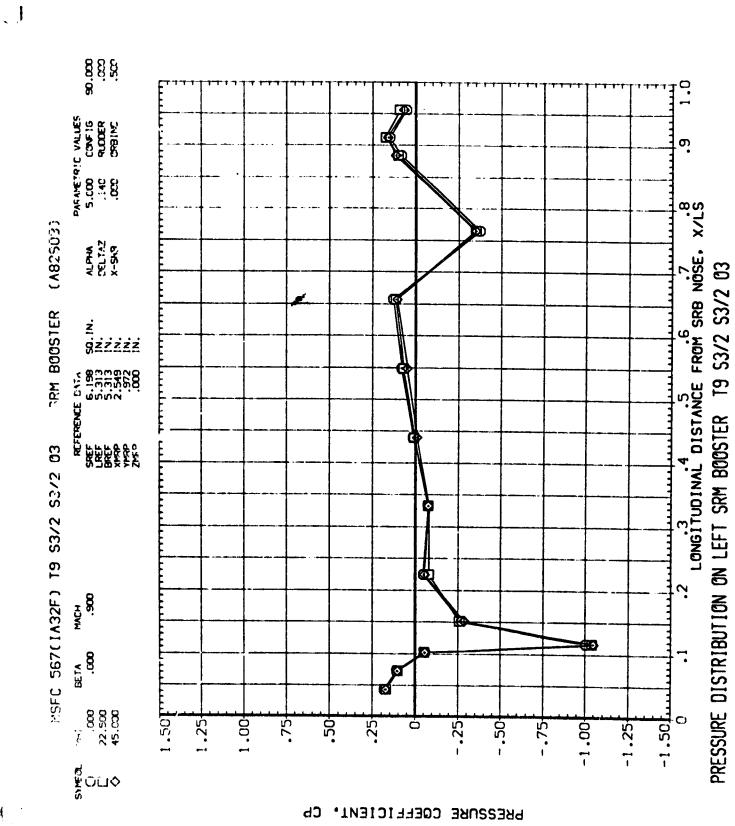
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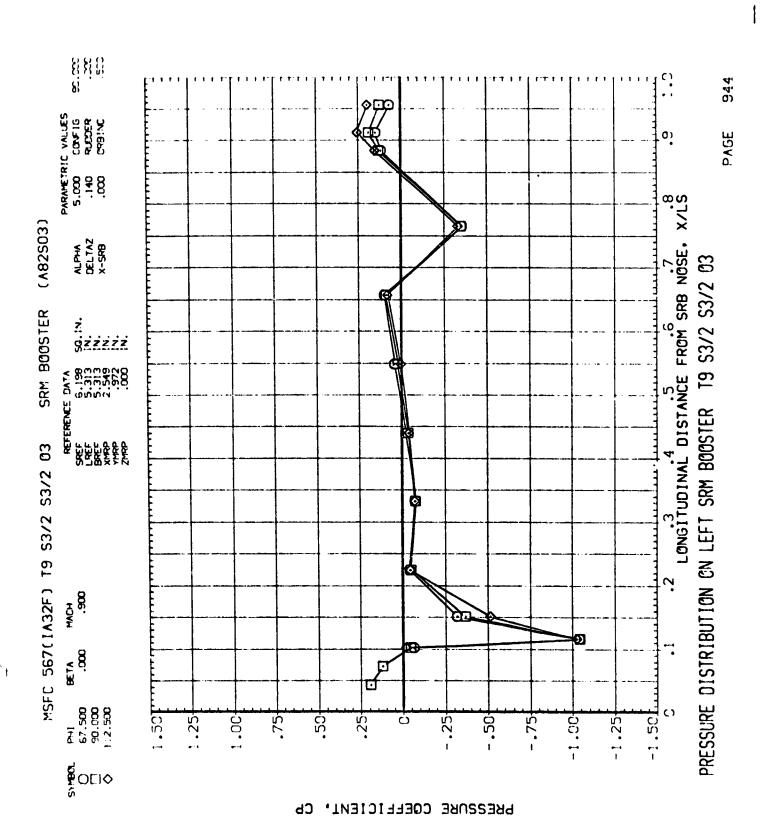
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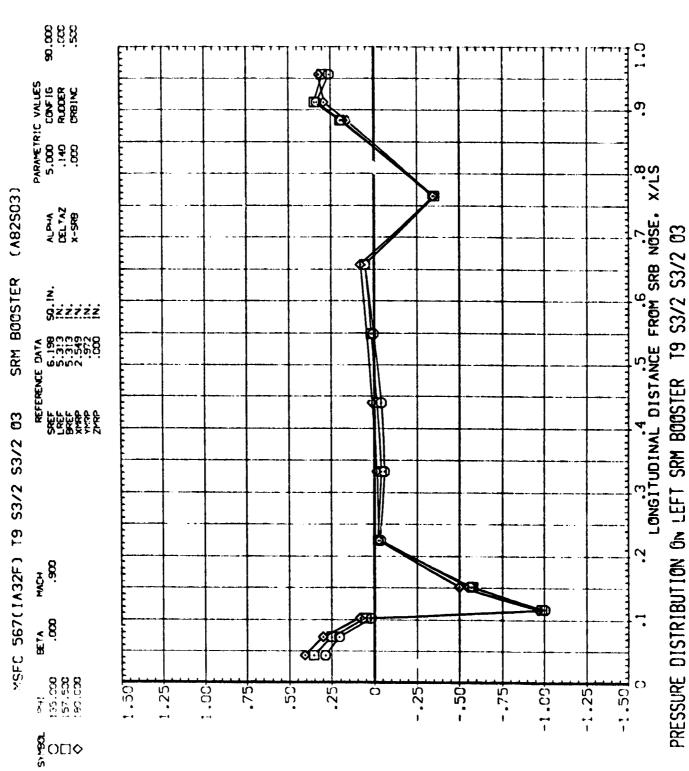


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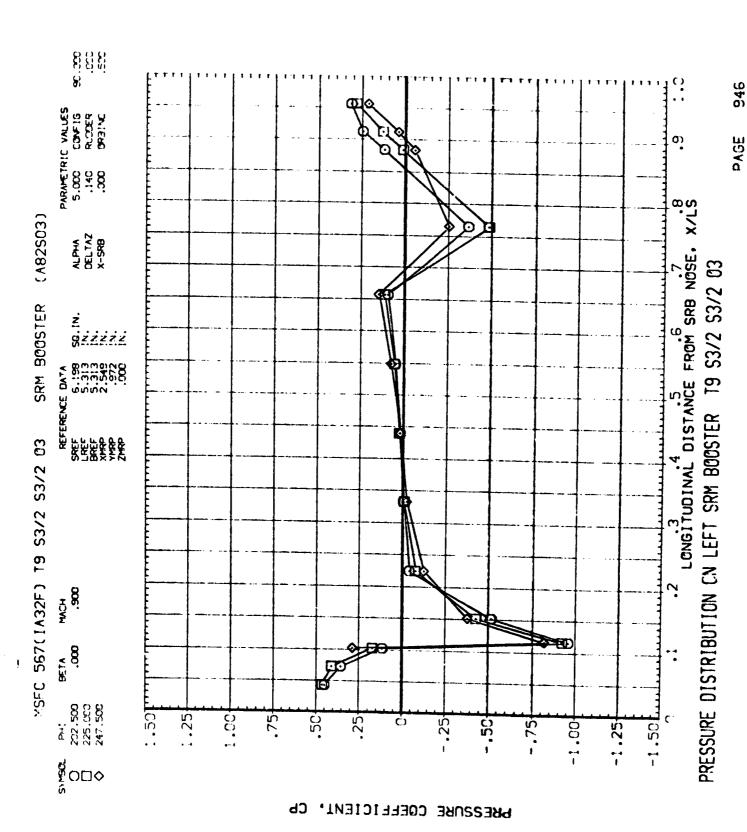


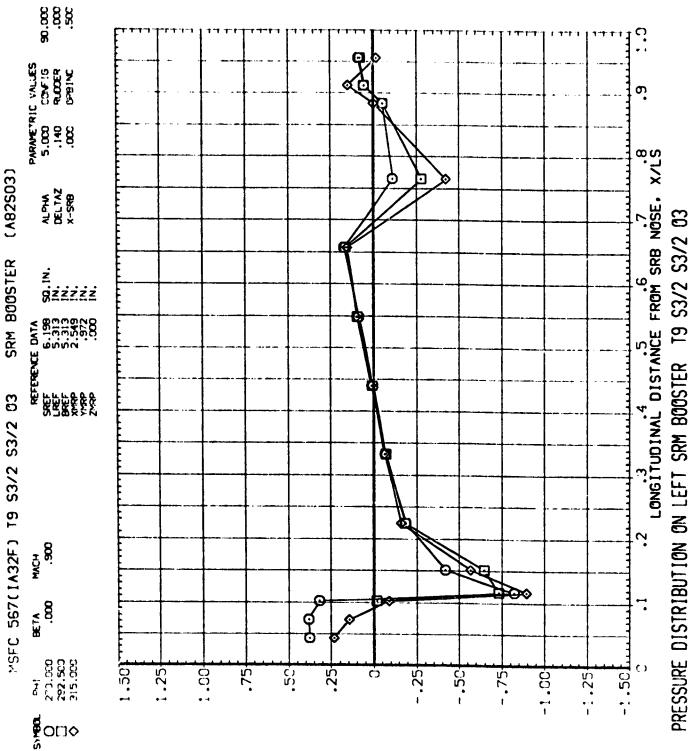
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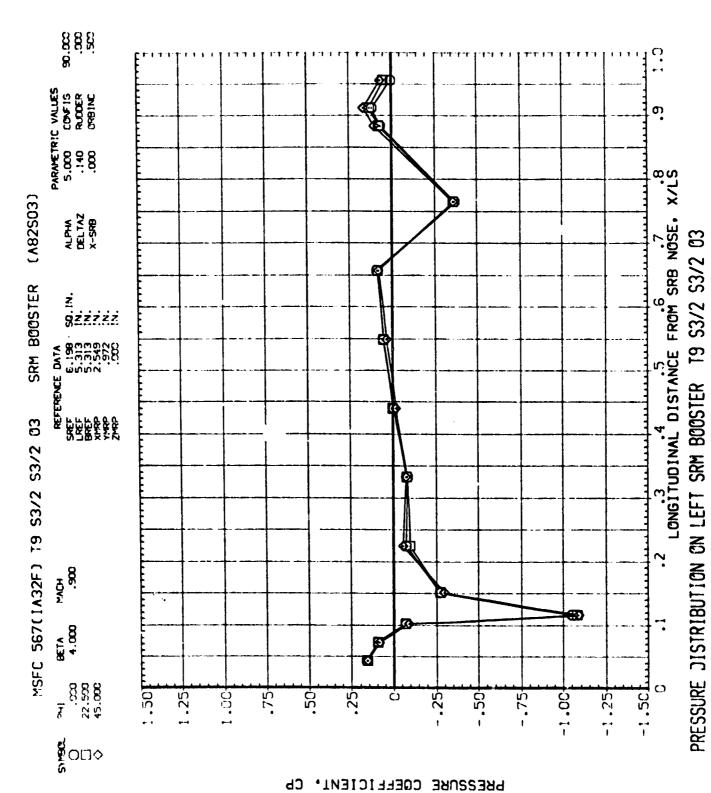
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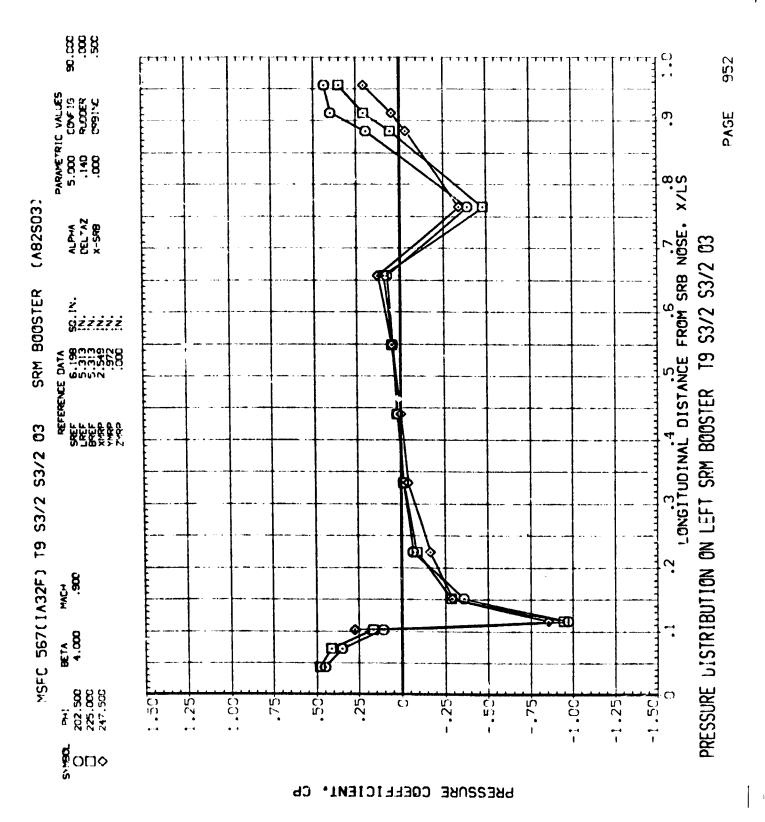
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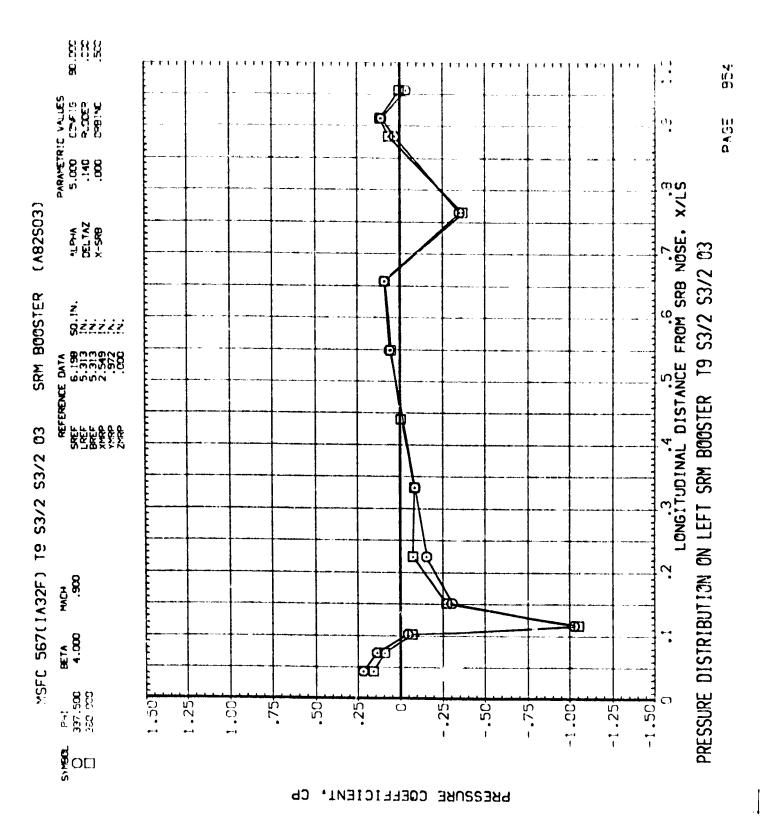
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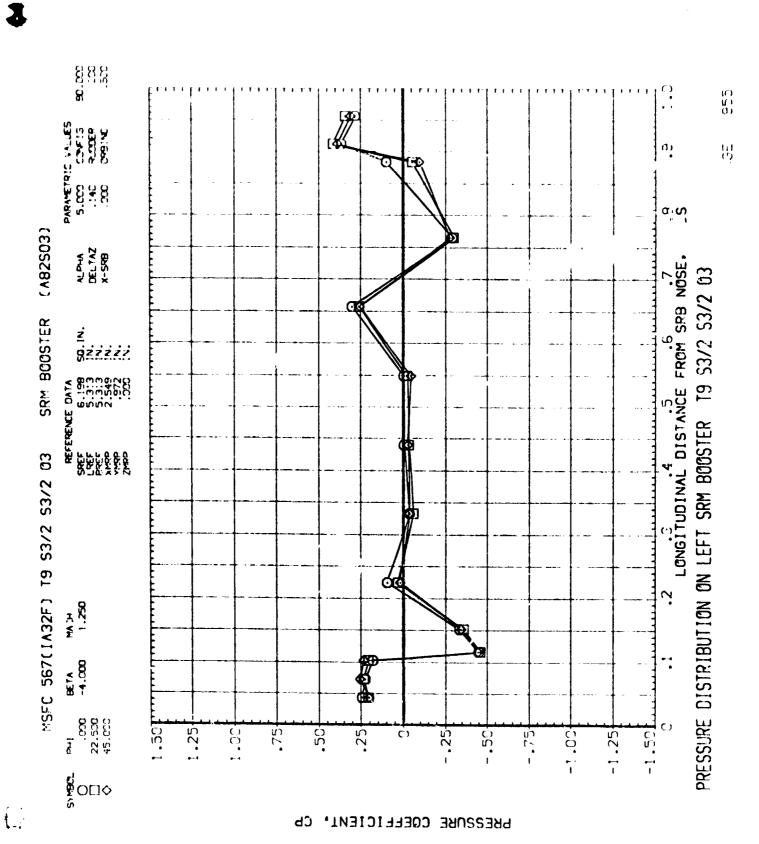


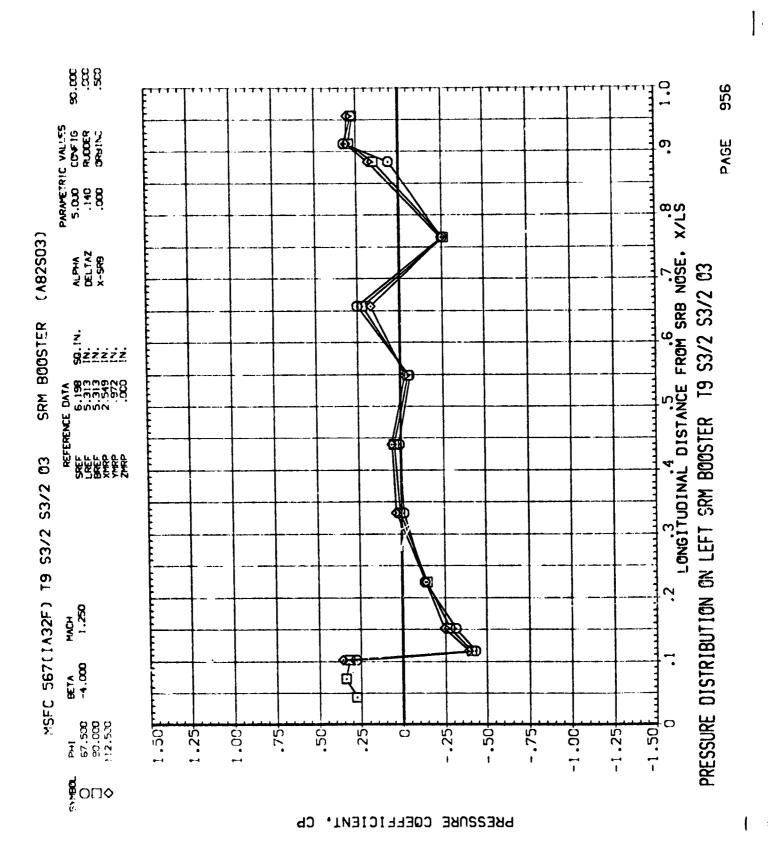
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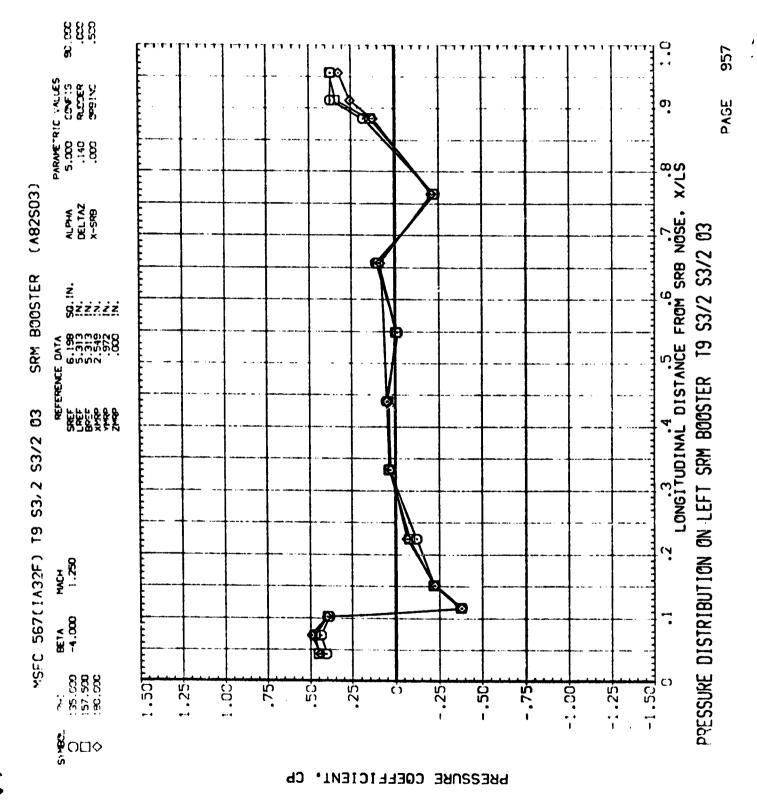
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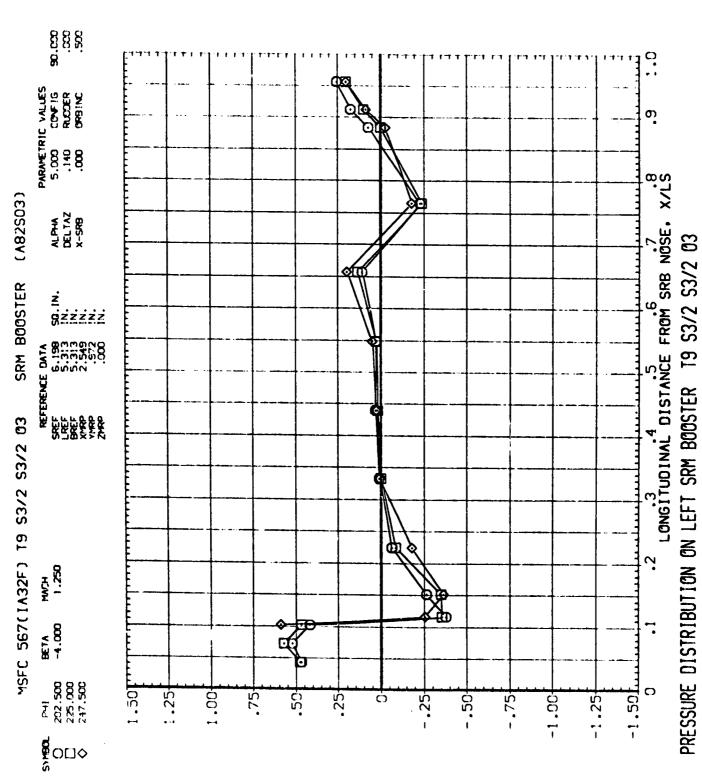
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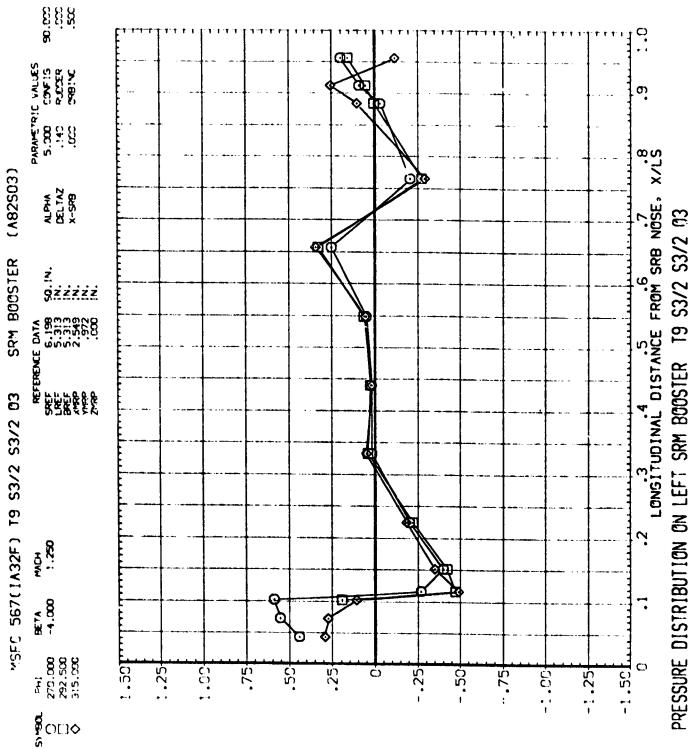




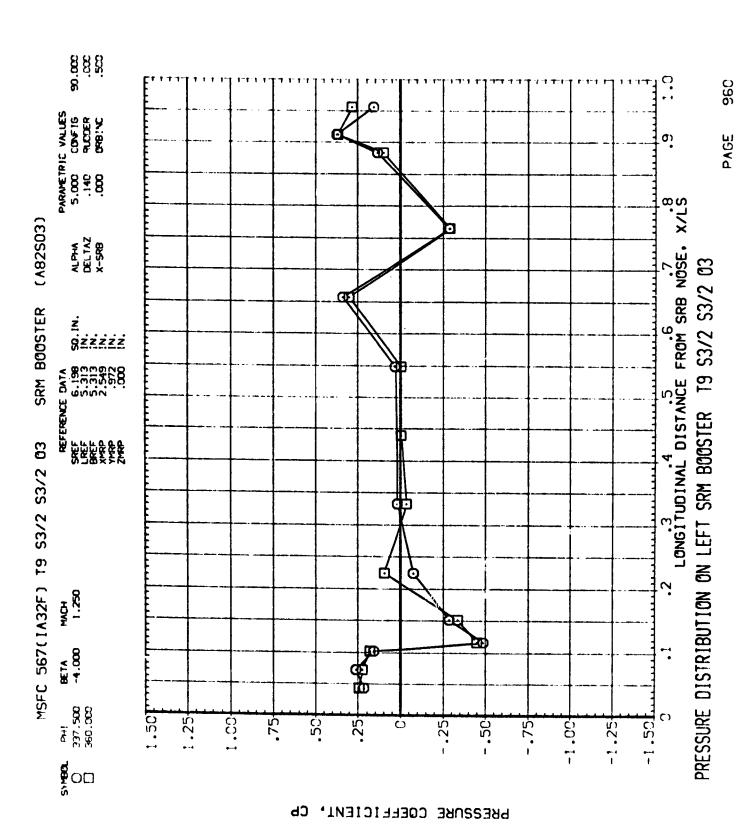


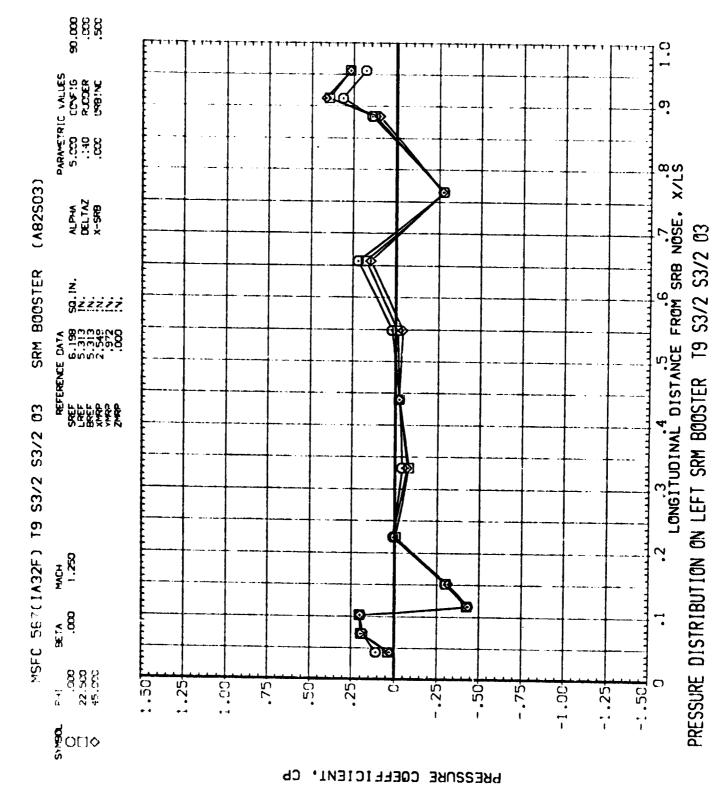
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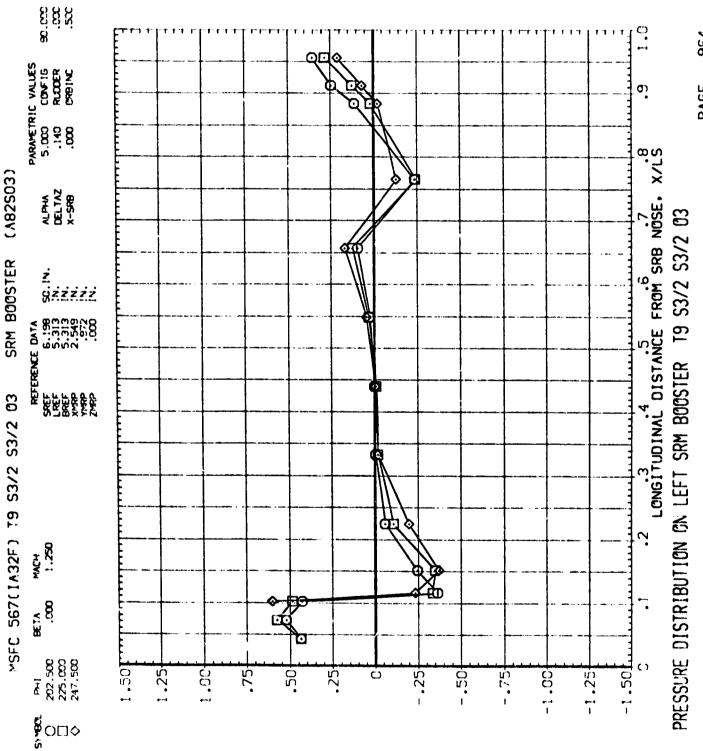


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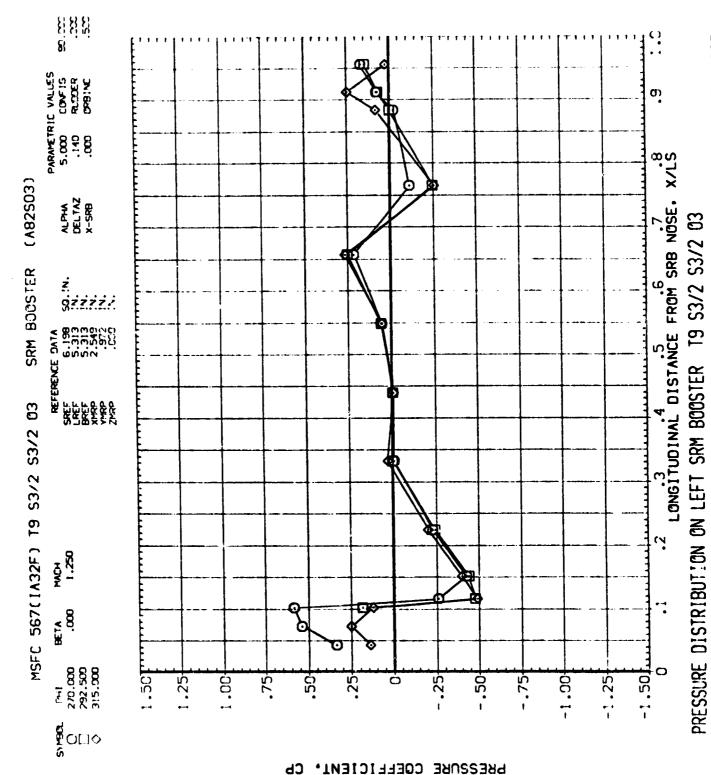
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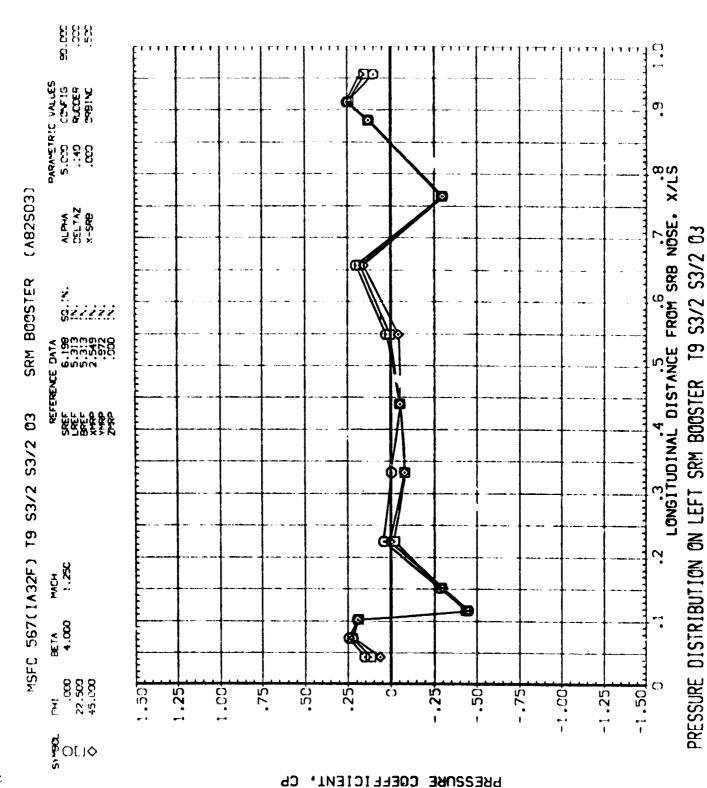
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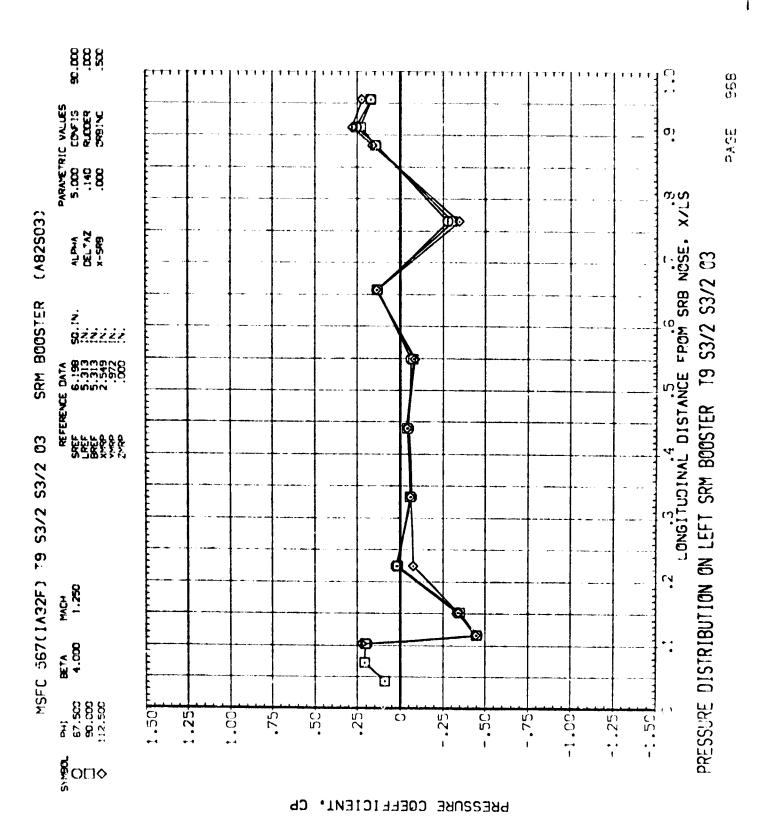


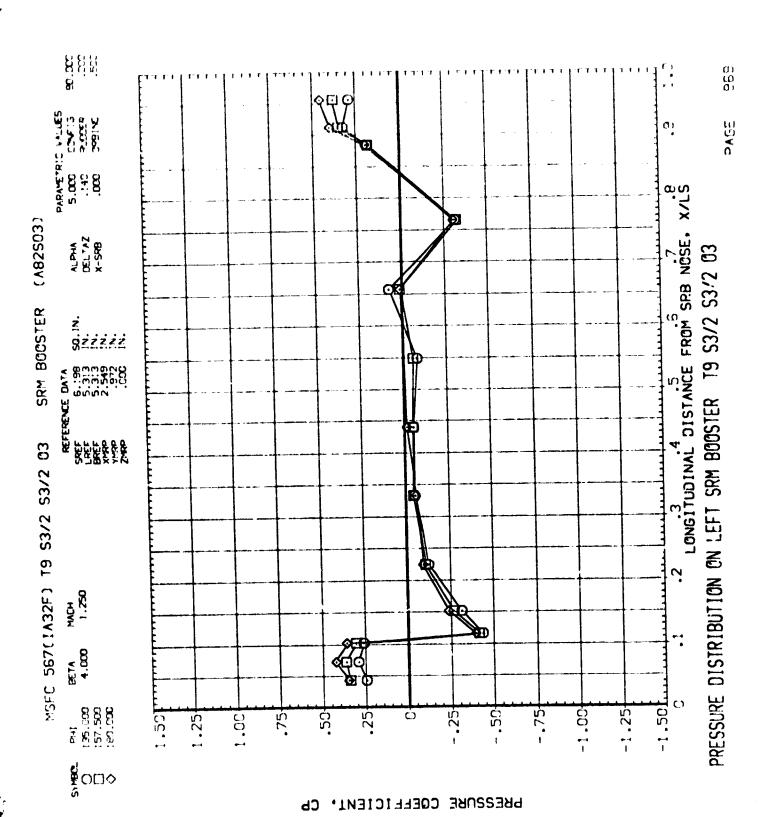
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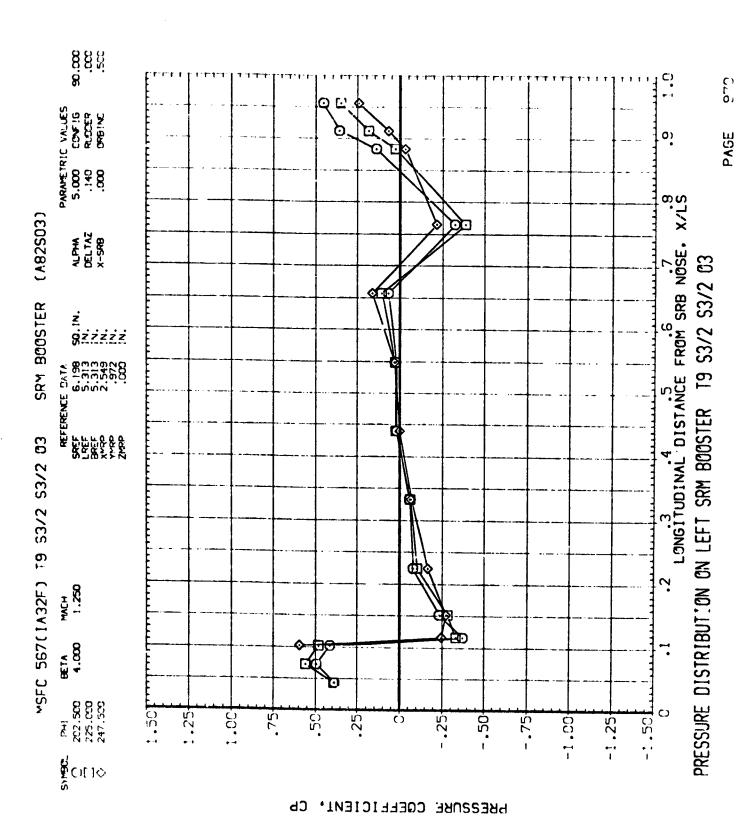


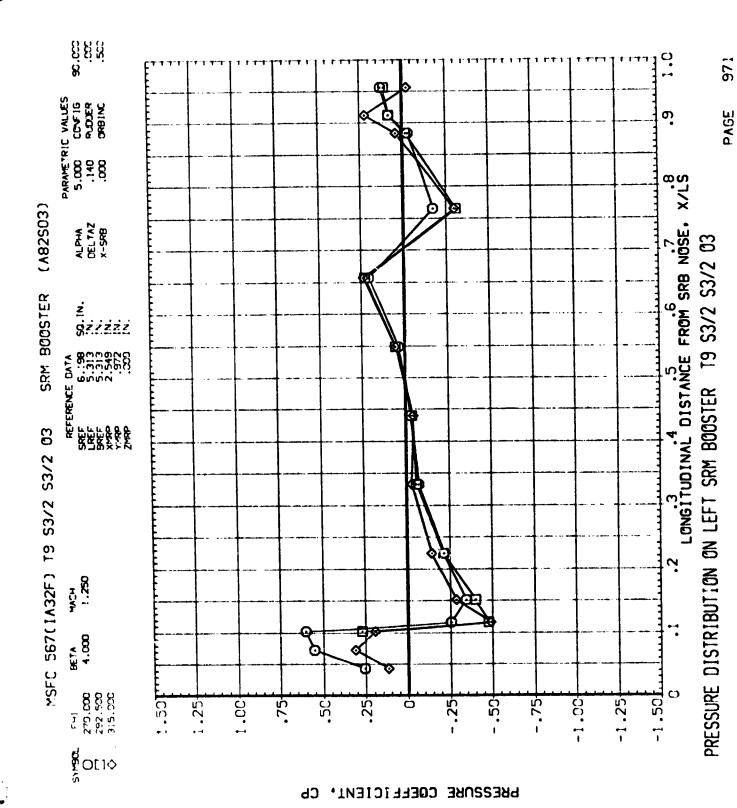
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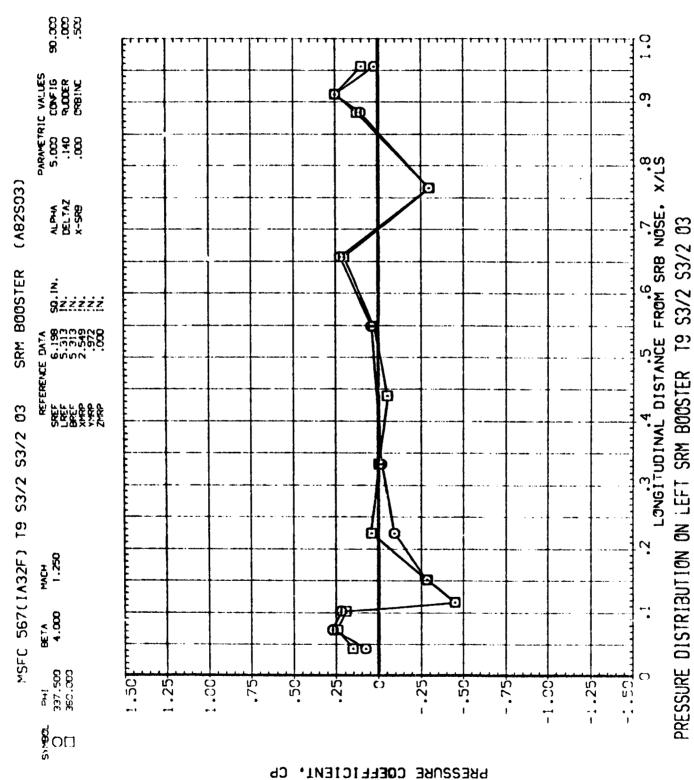


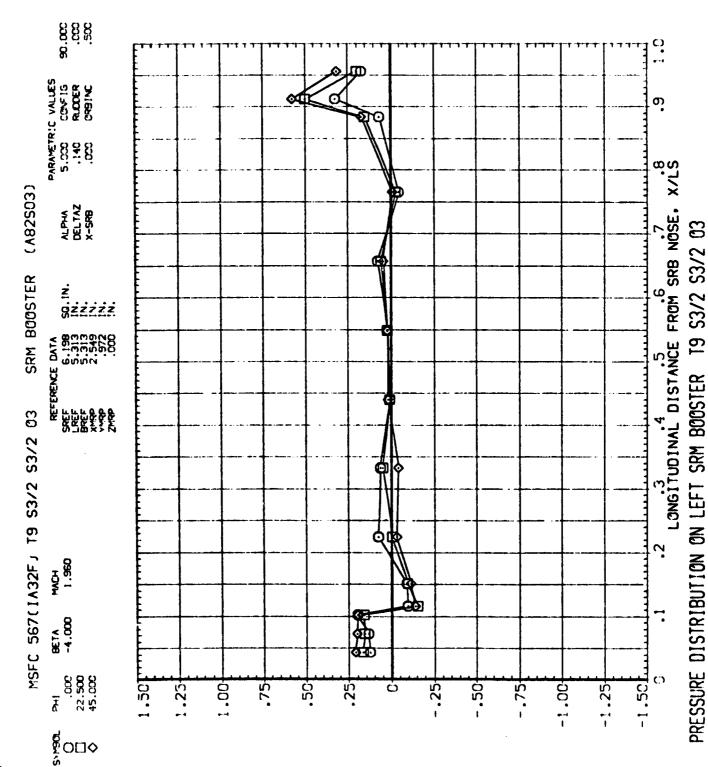




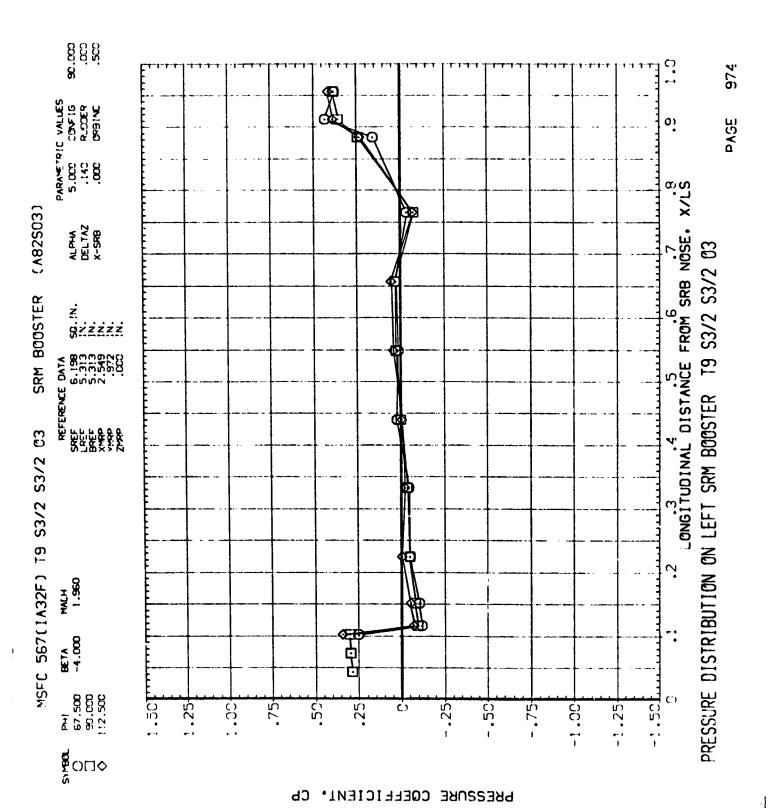


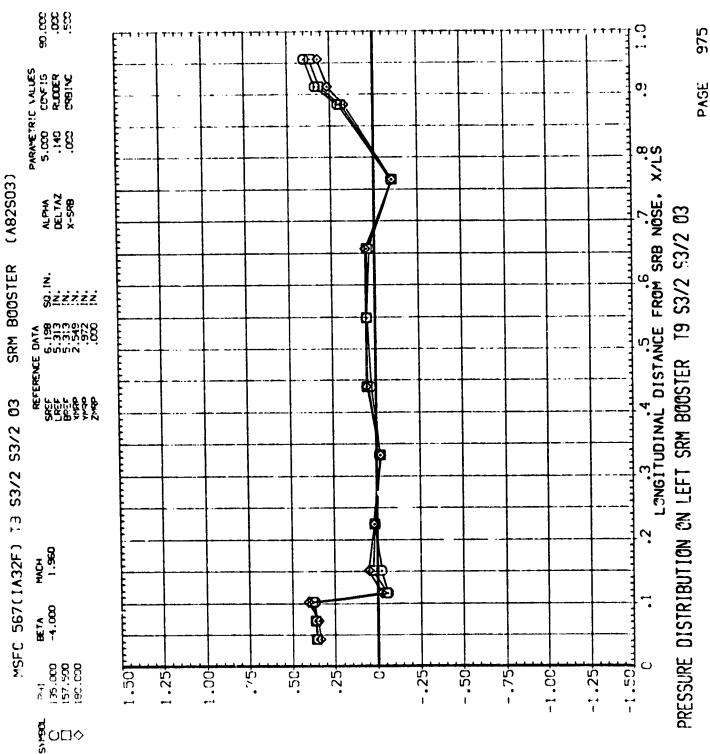


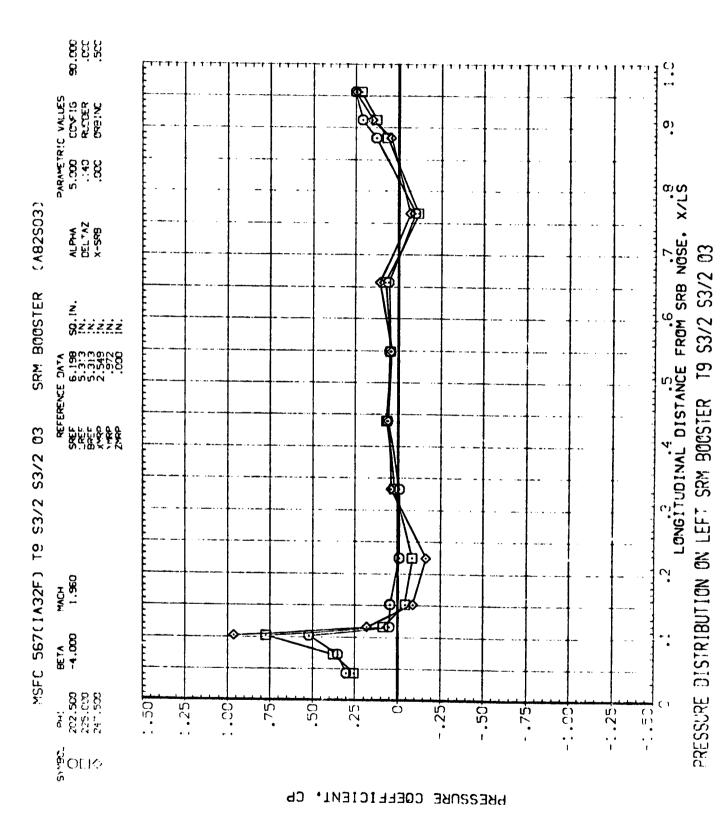


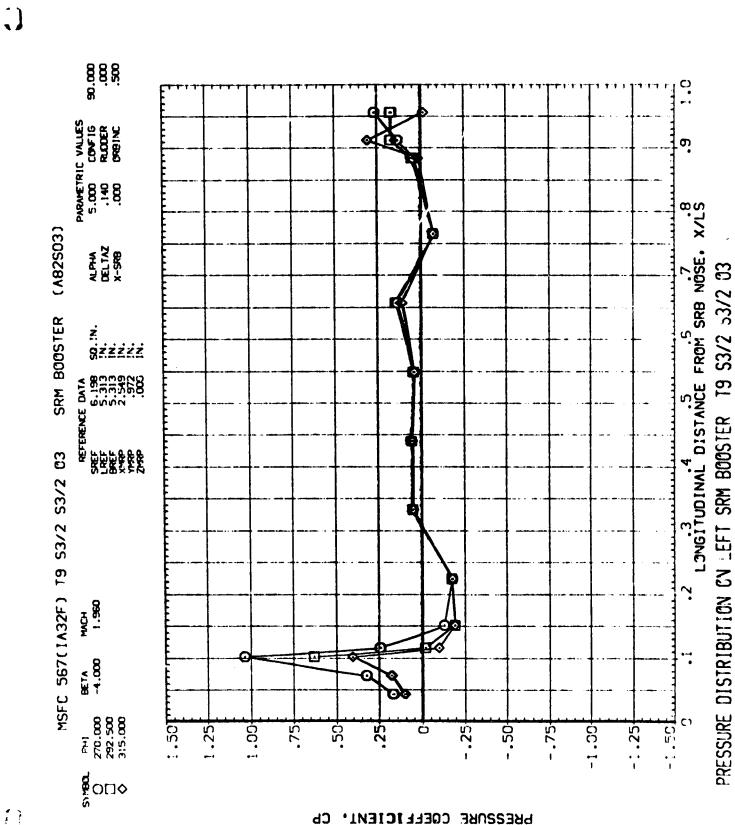


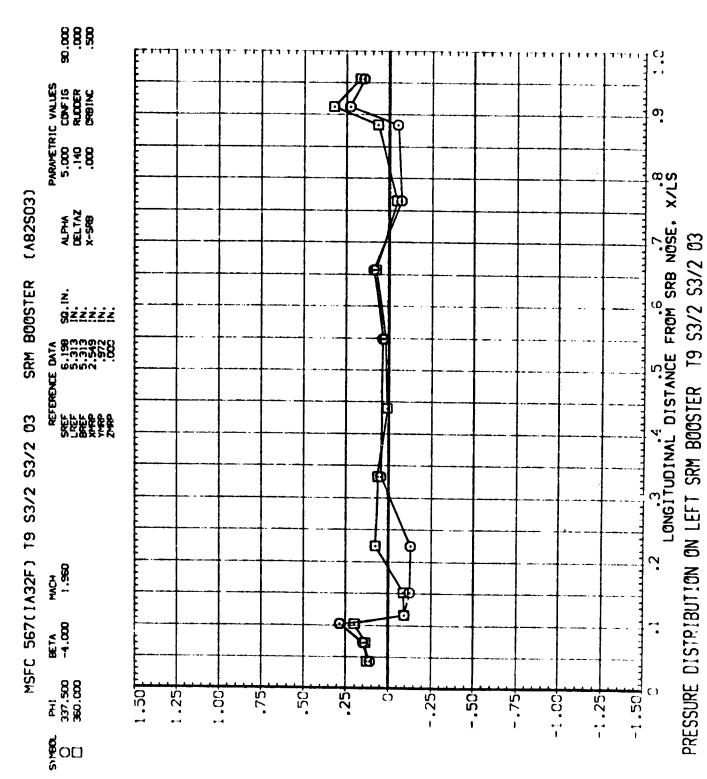
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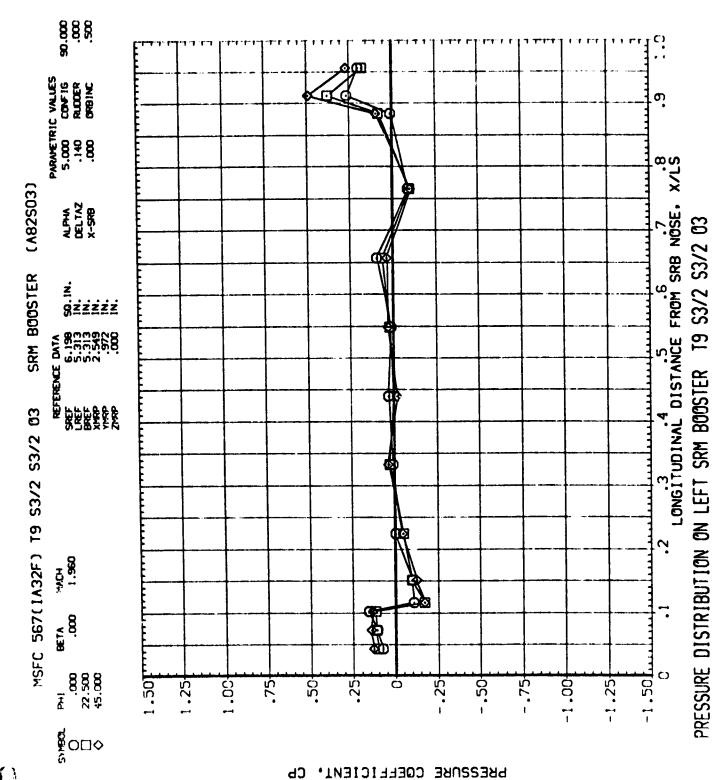


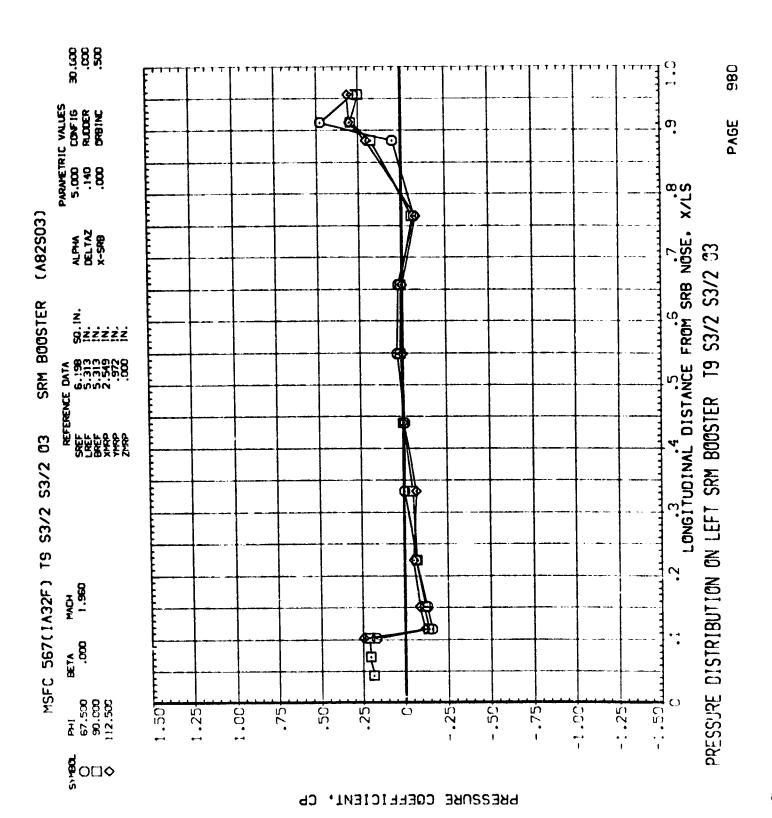


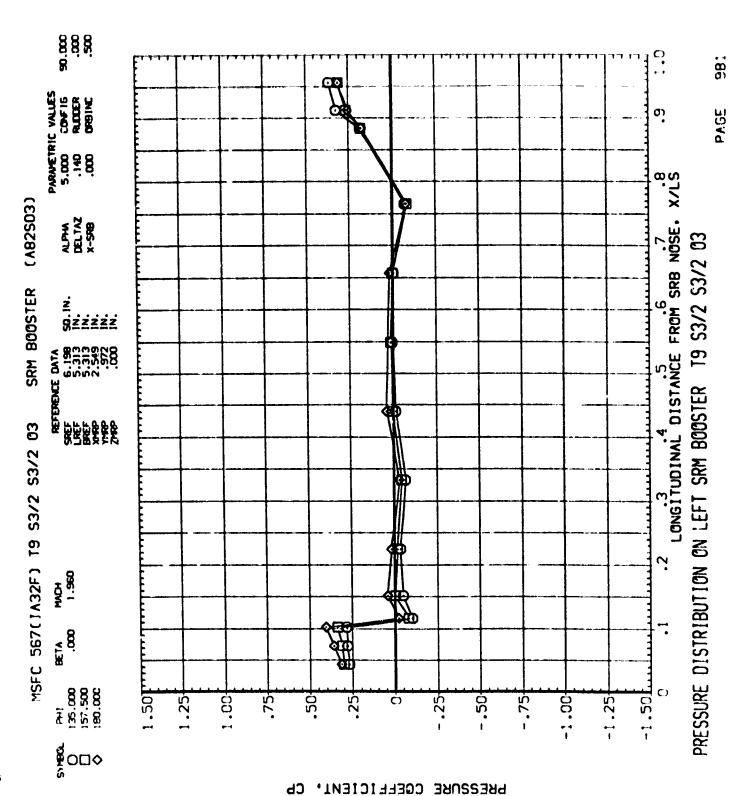


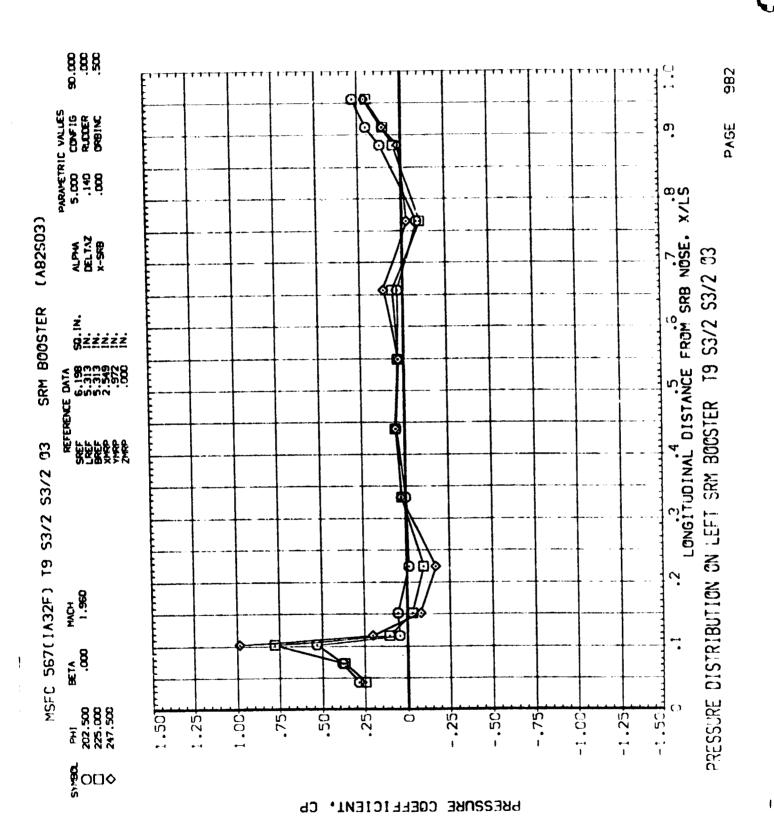


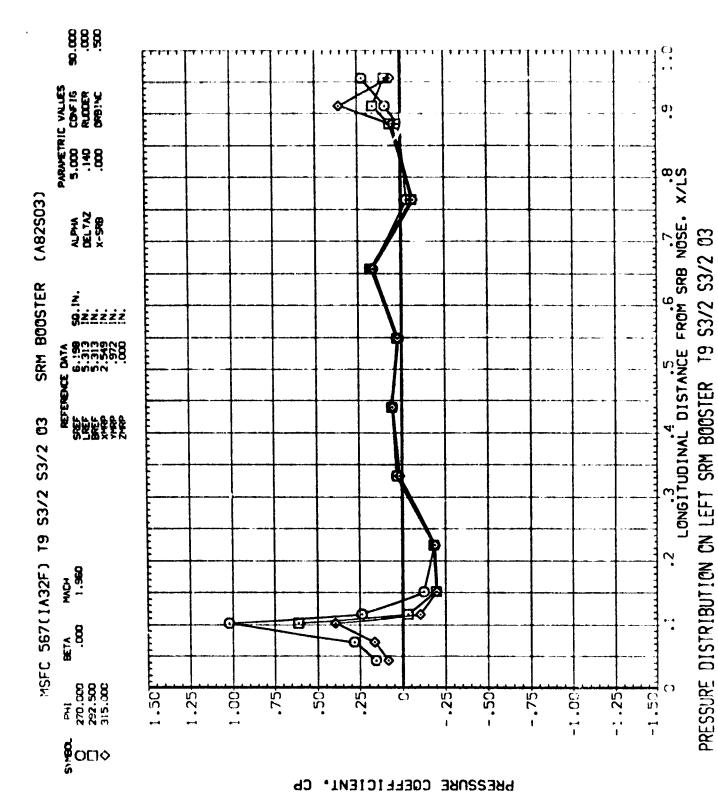
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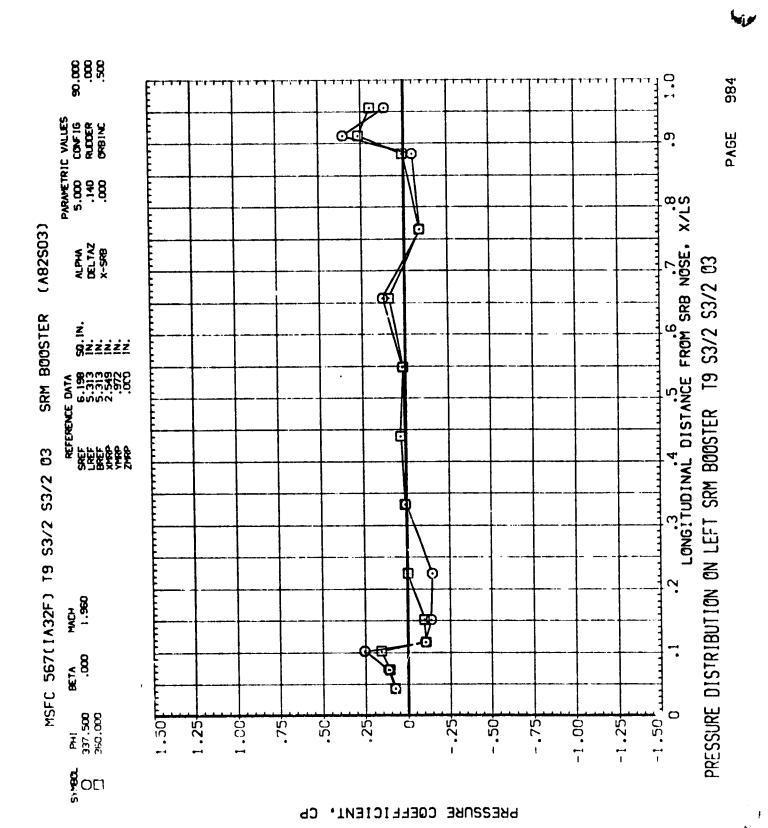




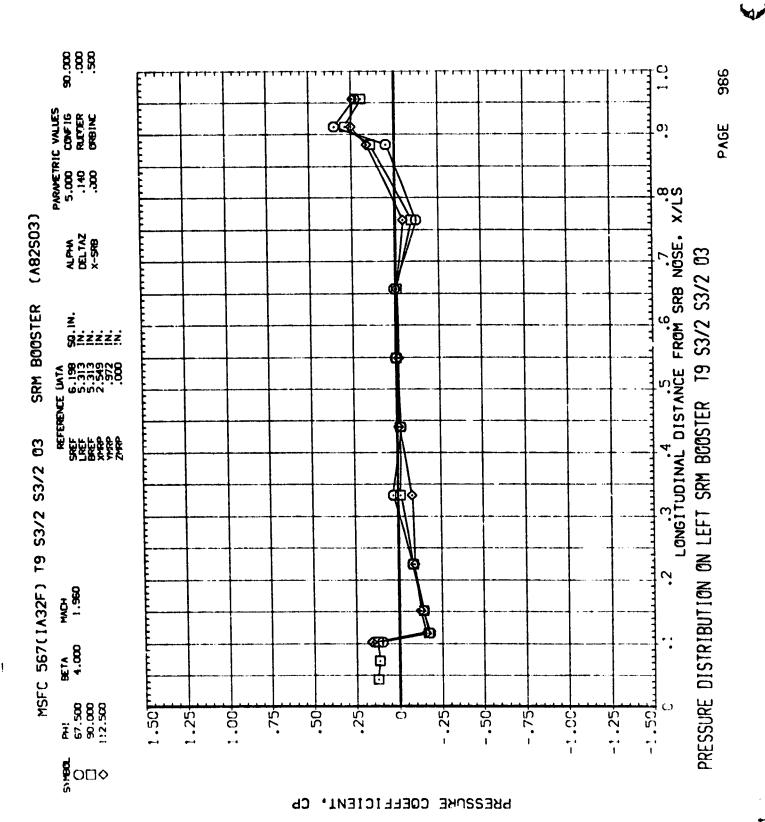


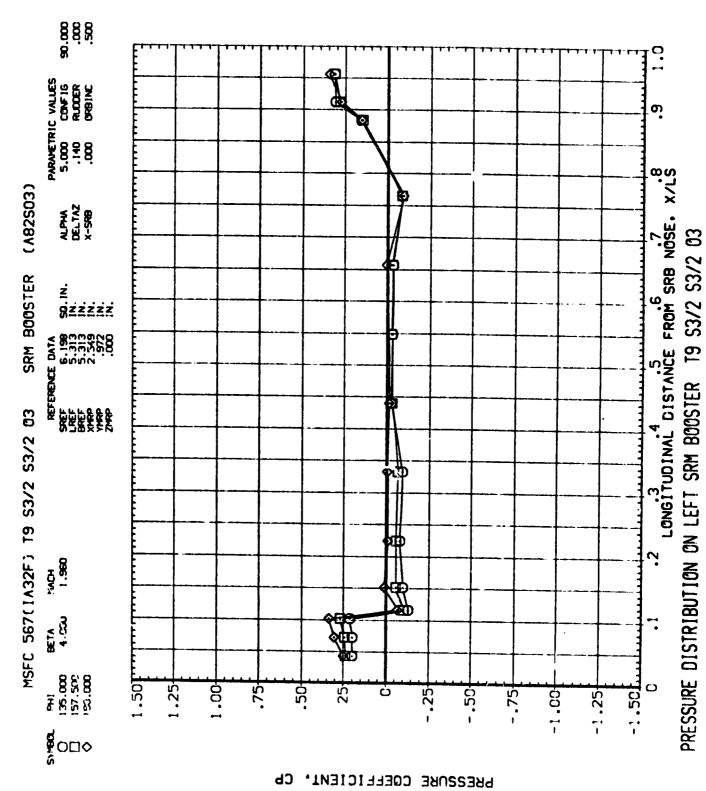






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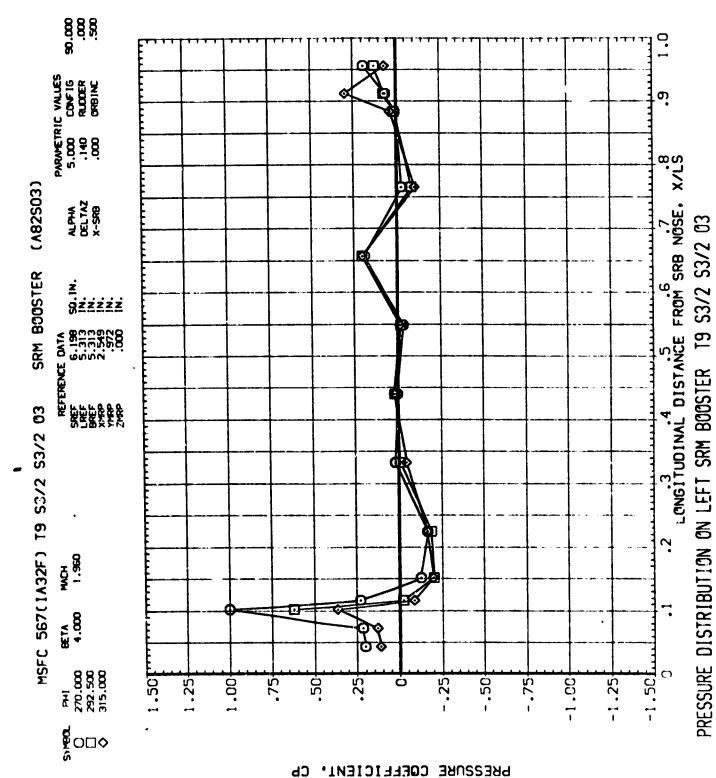


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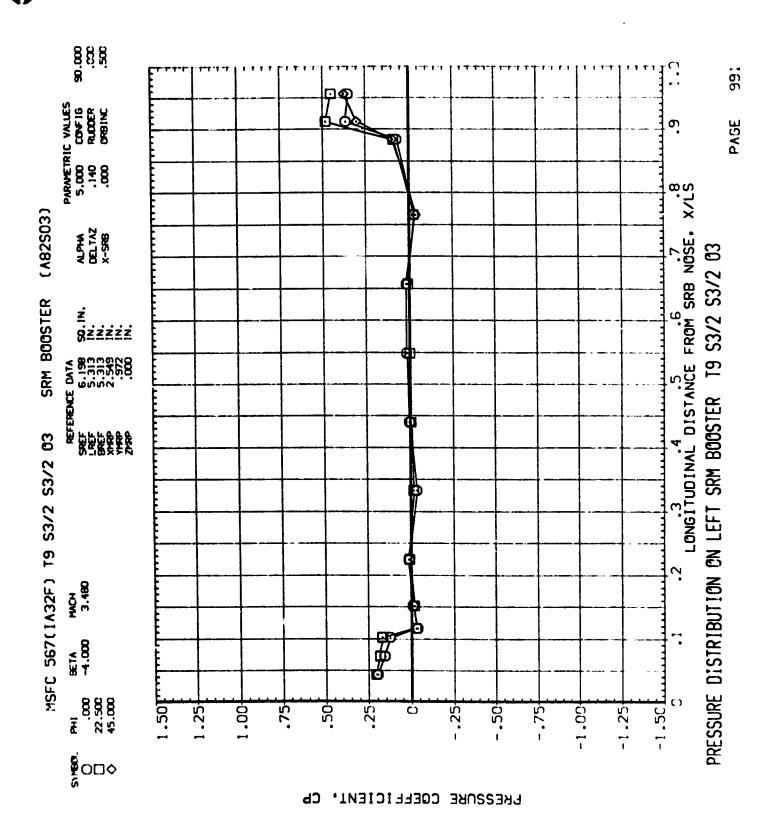
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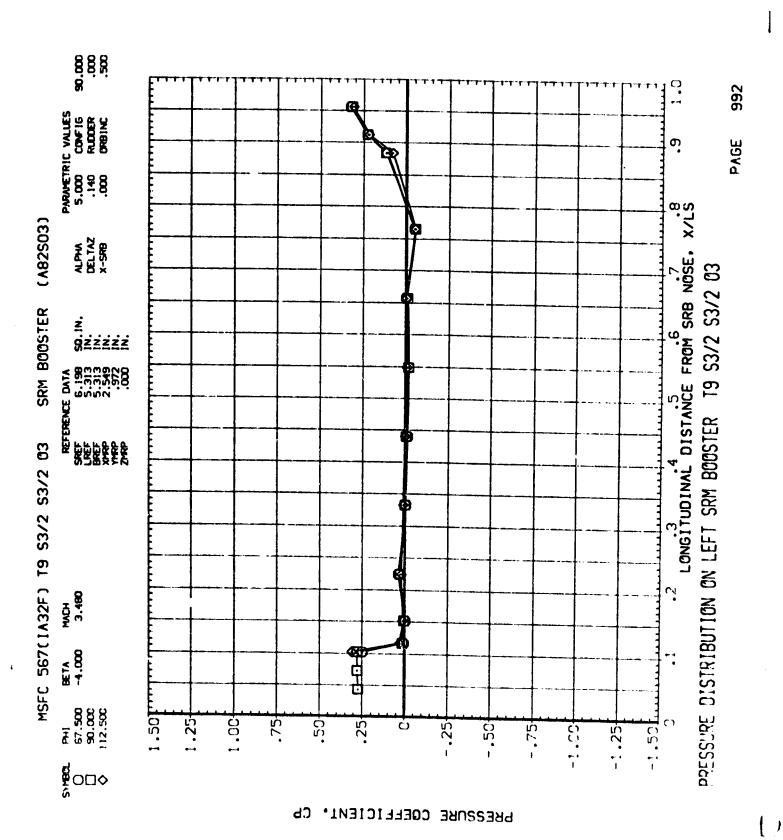
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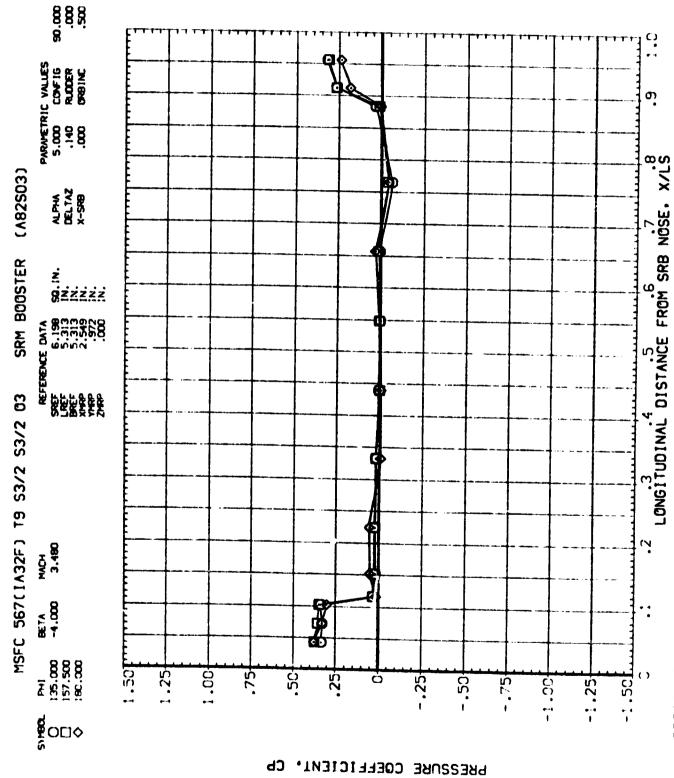


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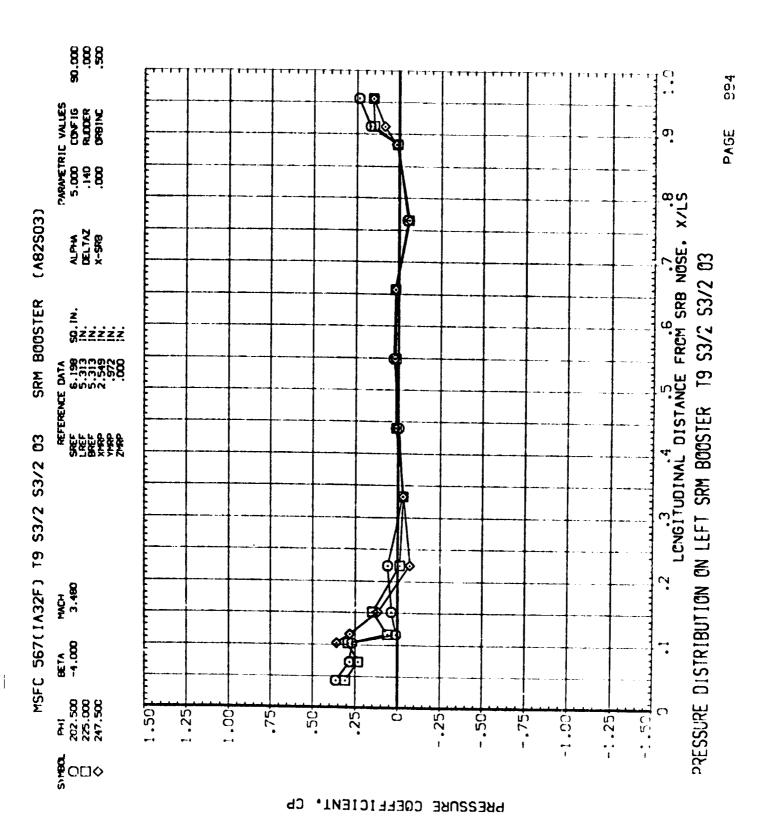


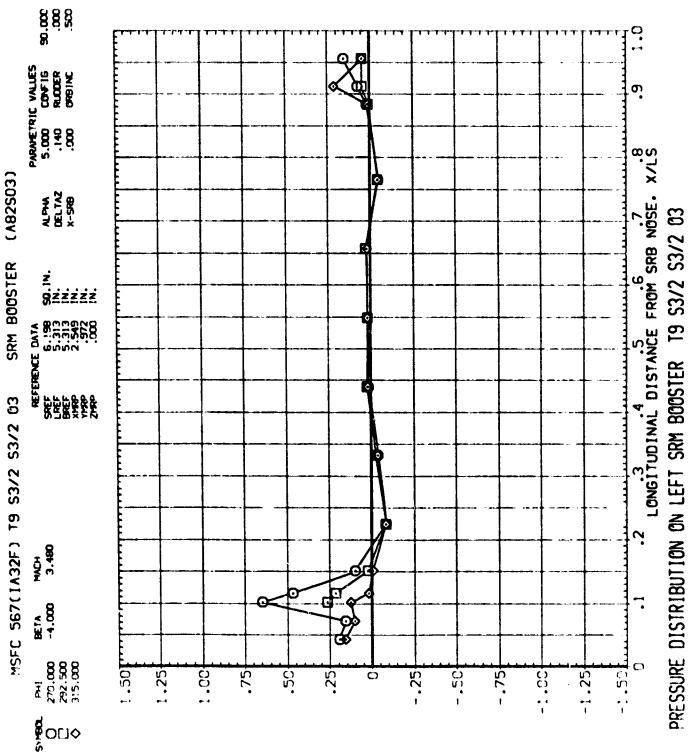


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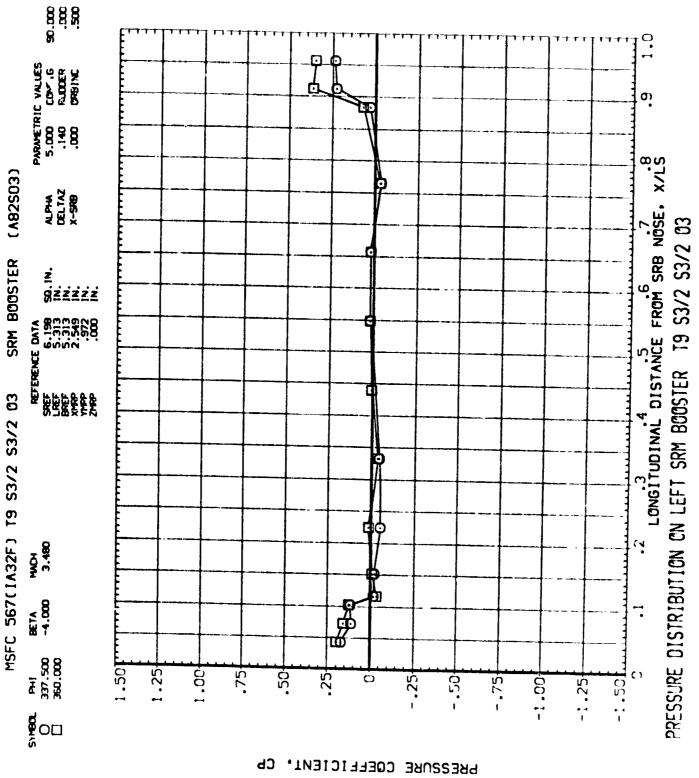




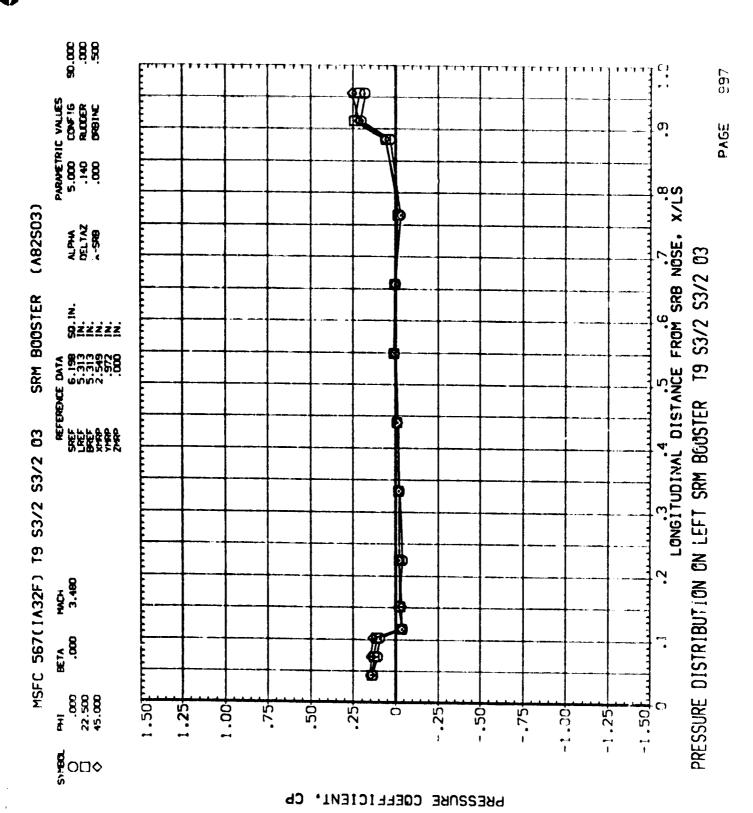
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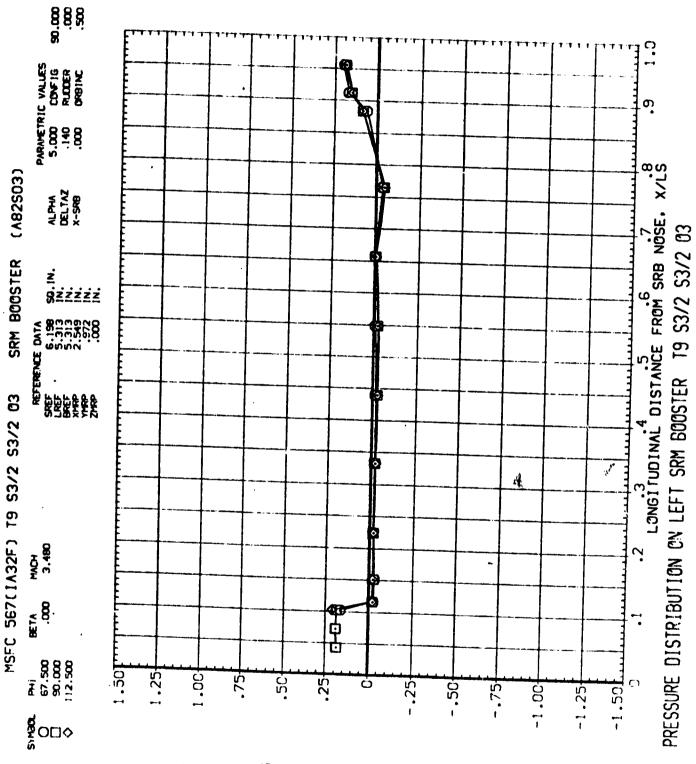
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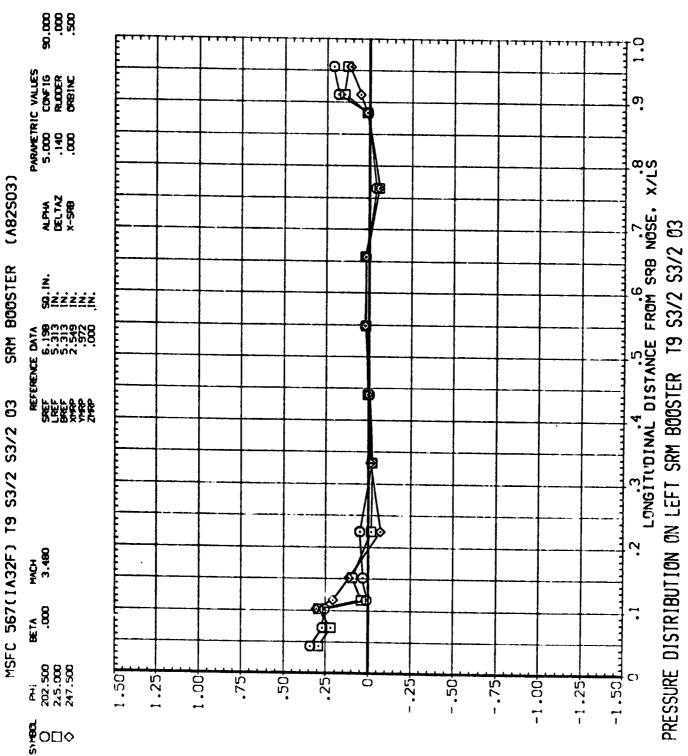


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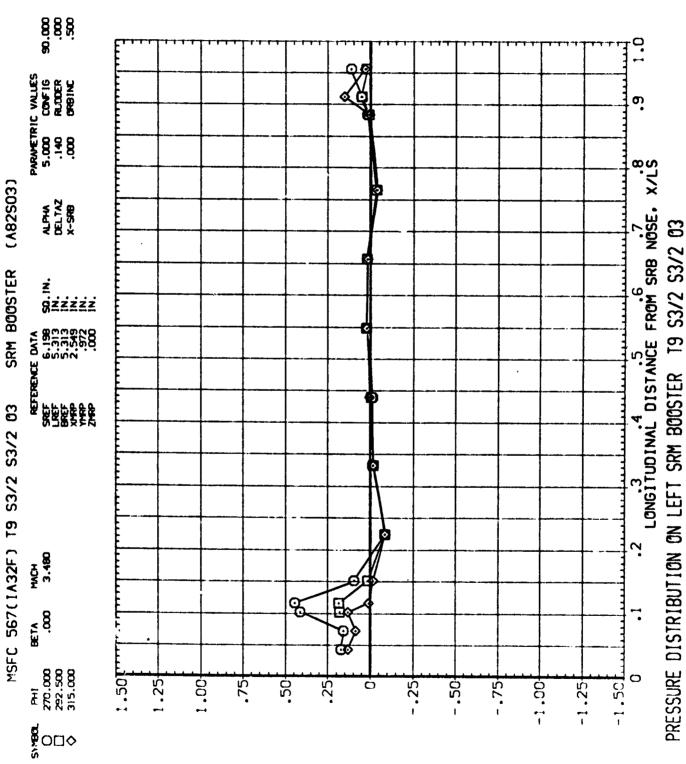




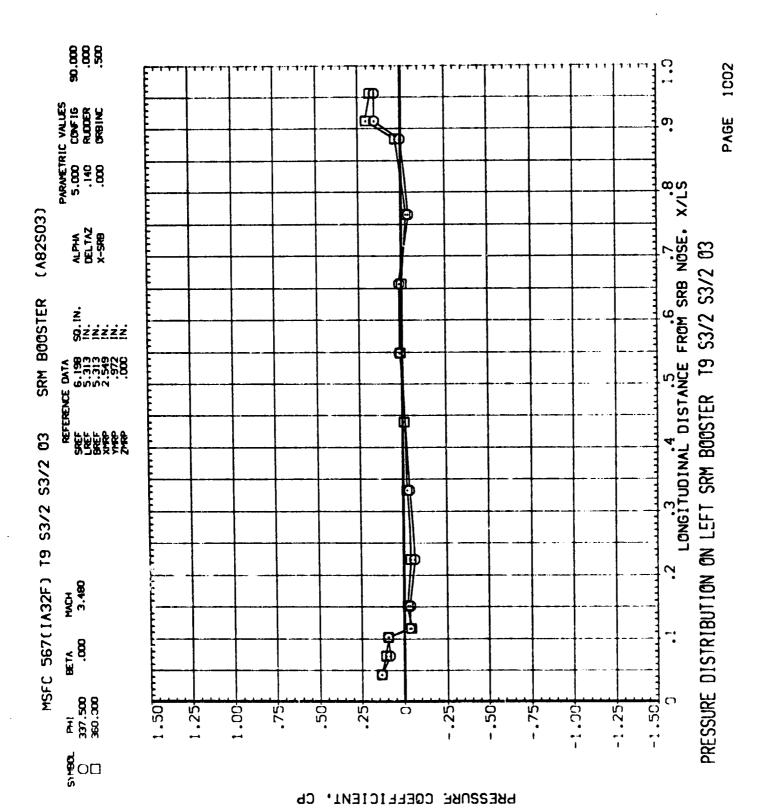
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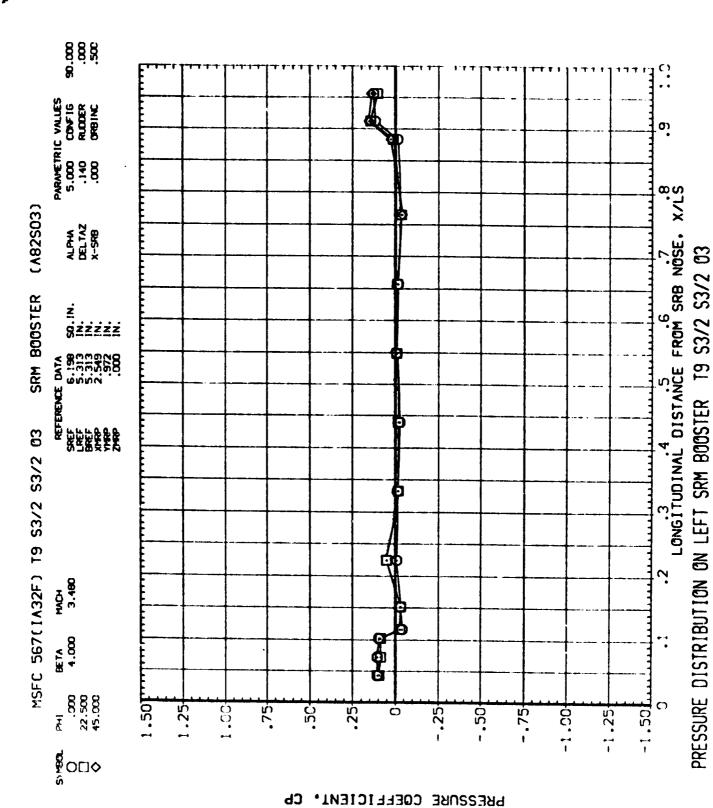


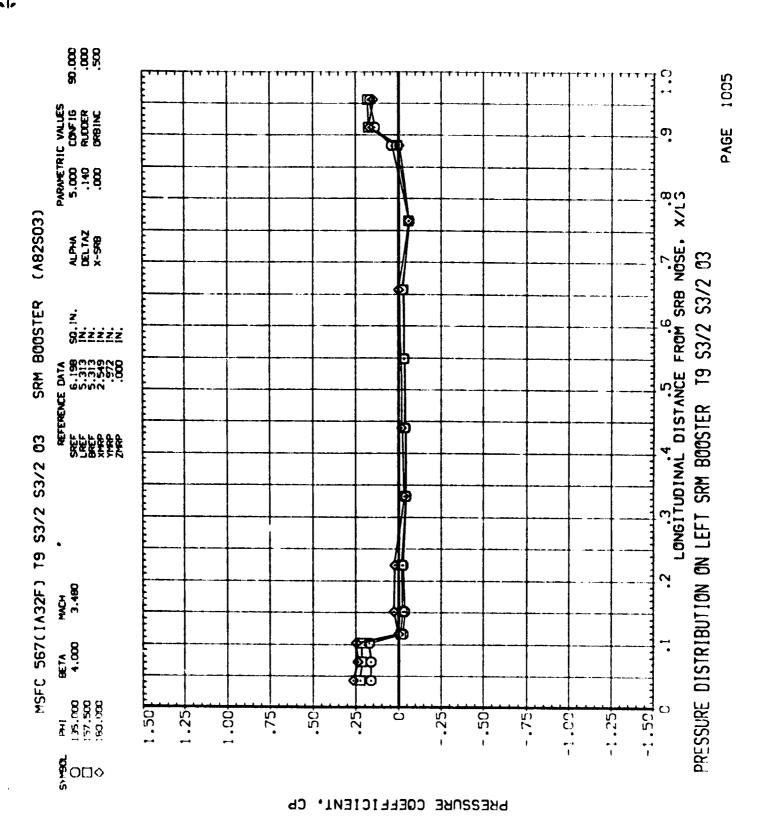
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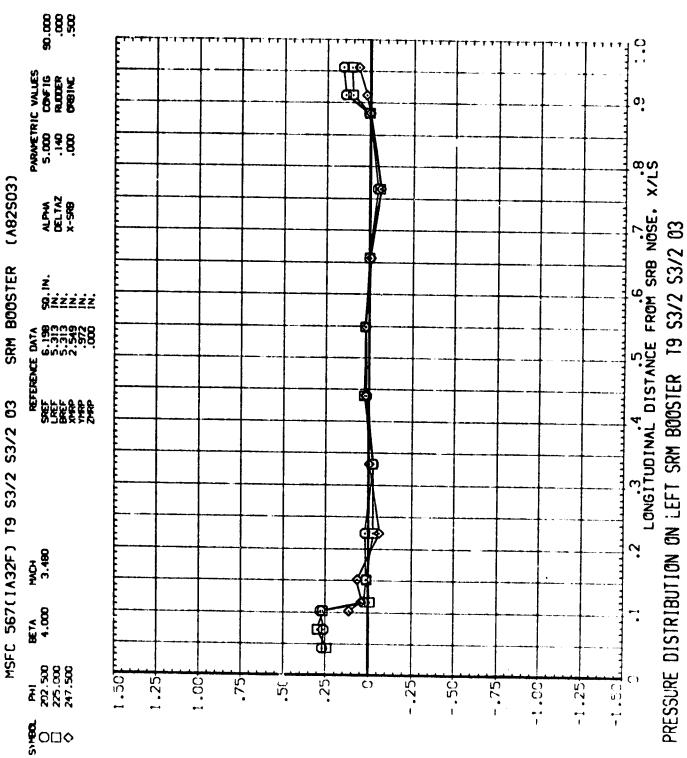


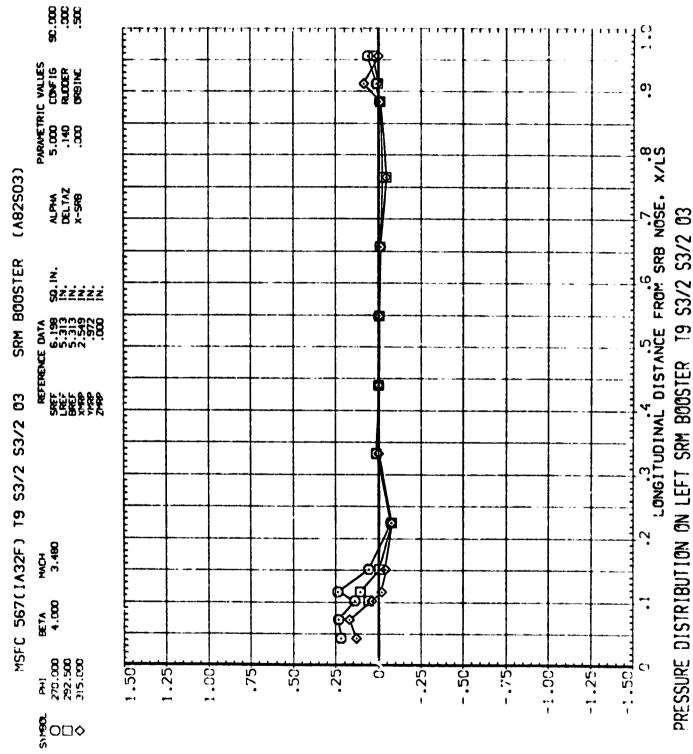
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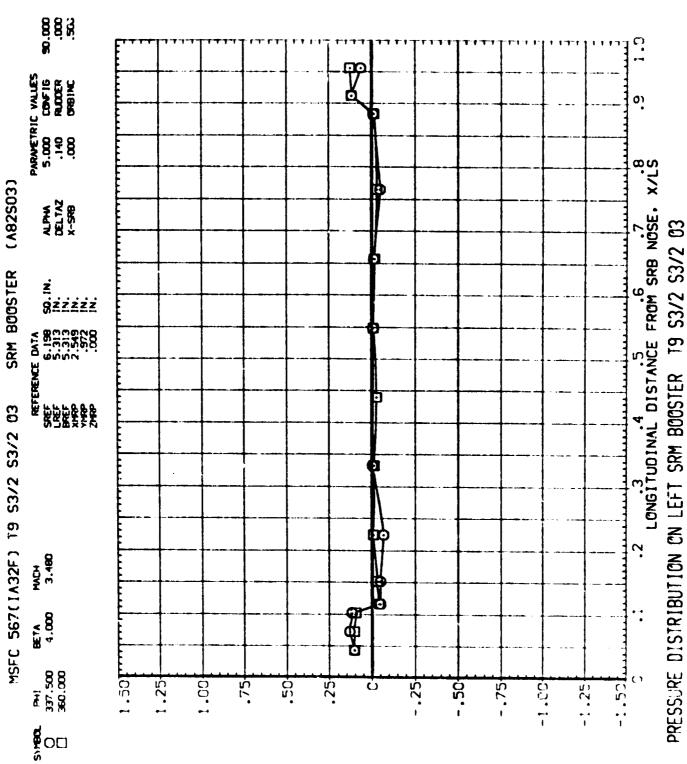






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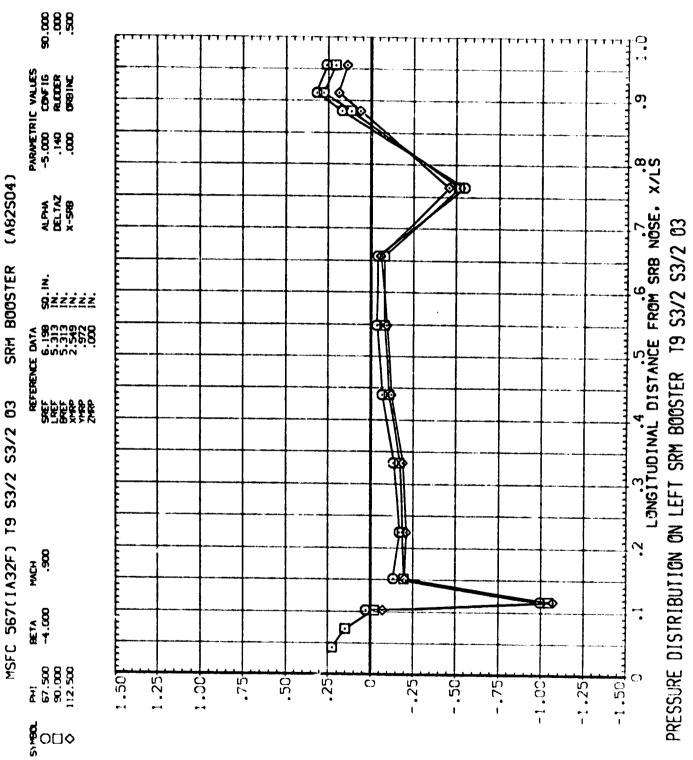


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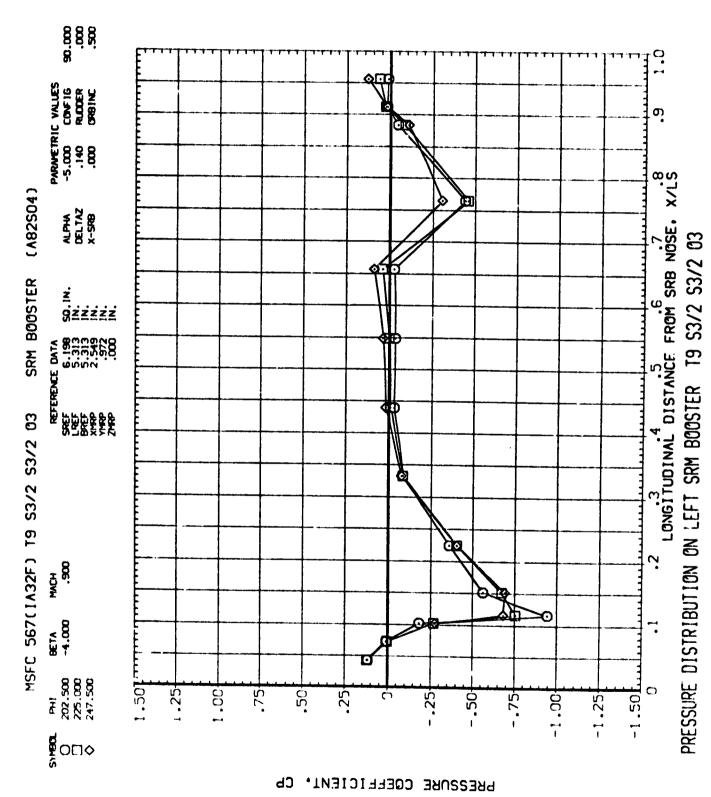


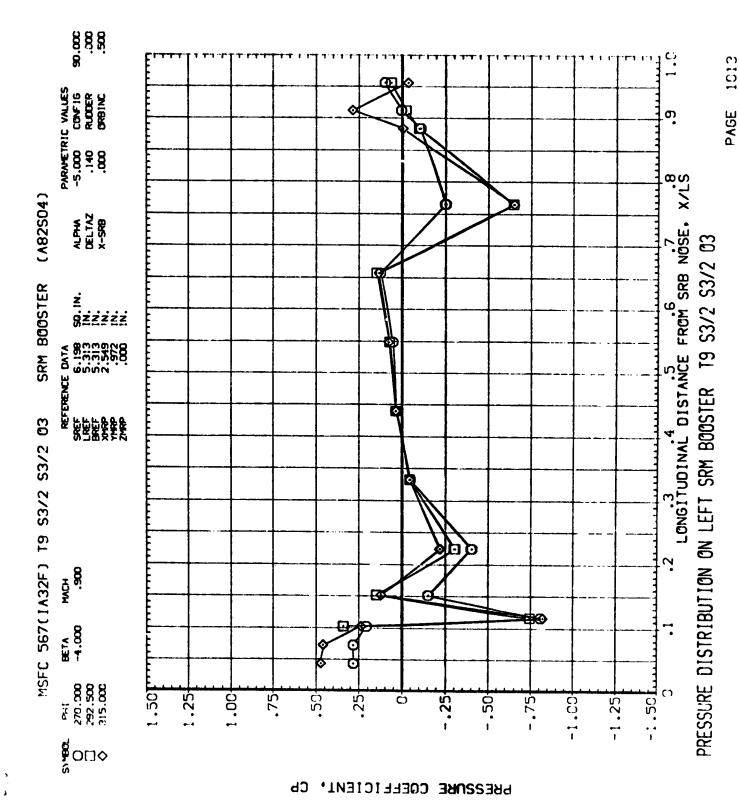
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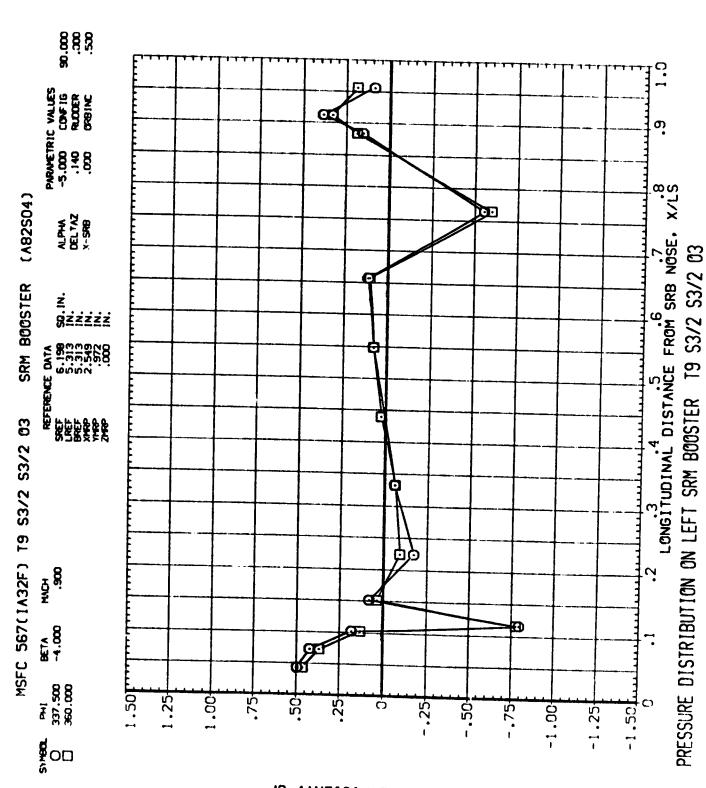
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PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER

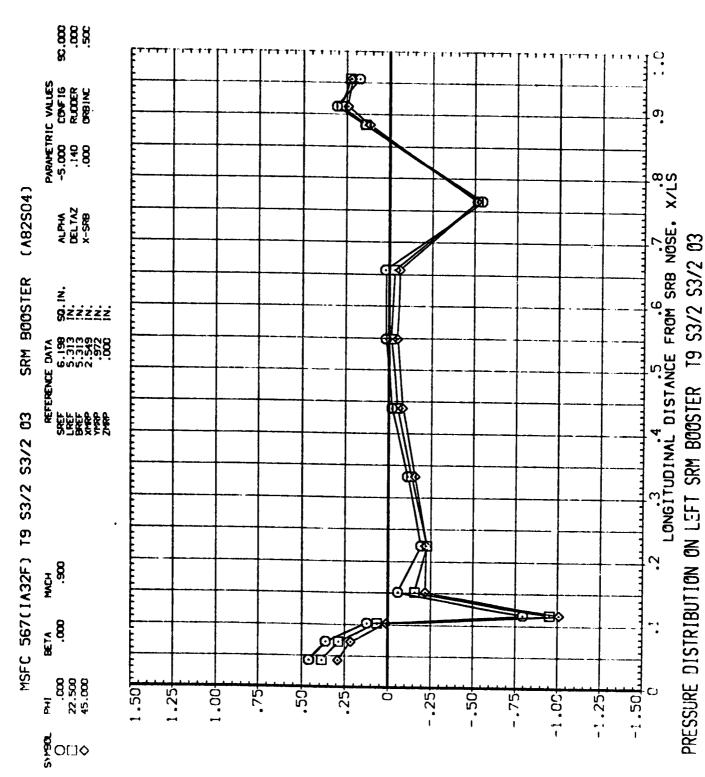
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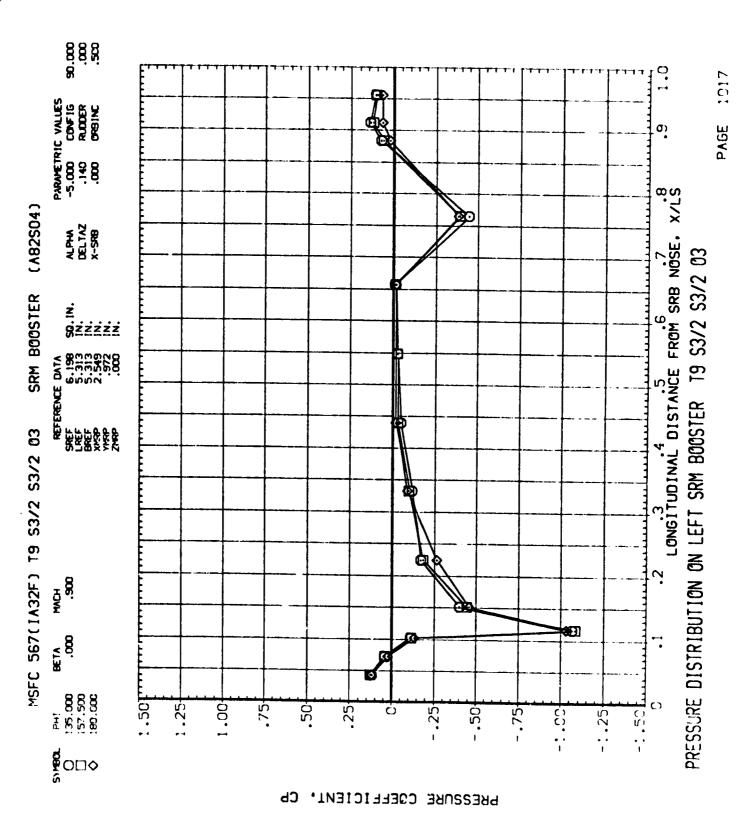
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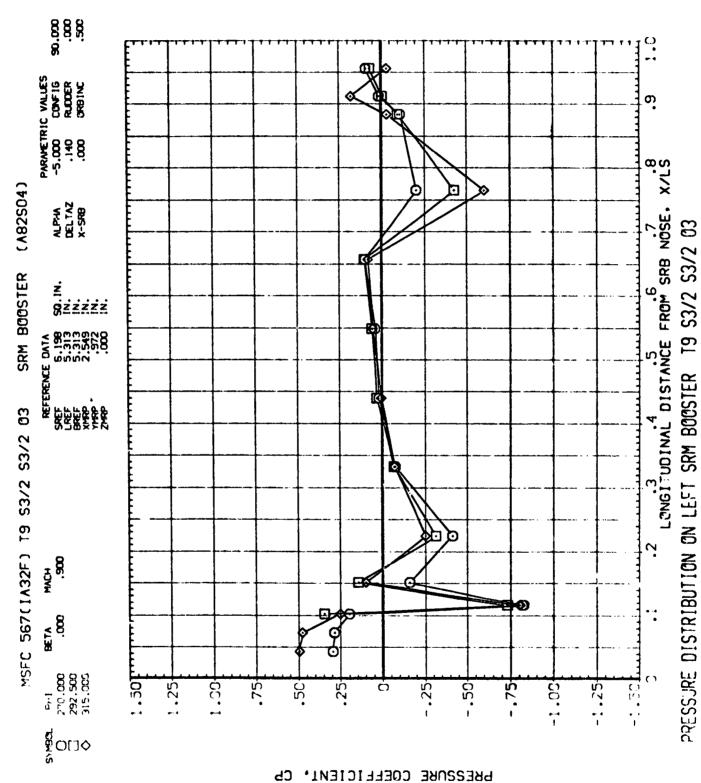
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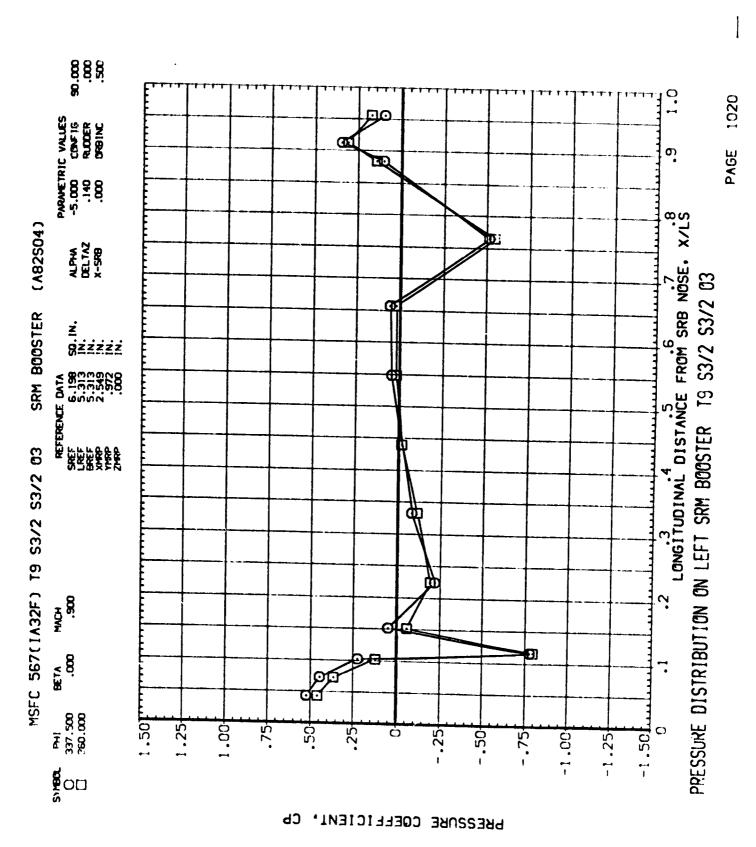
PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER 19 S3/2 S3/2 03

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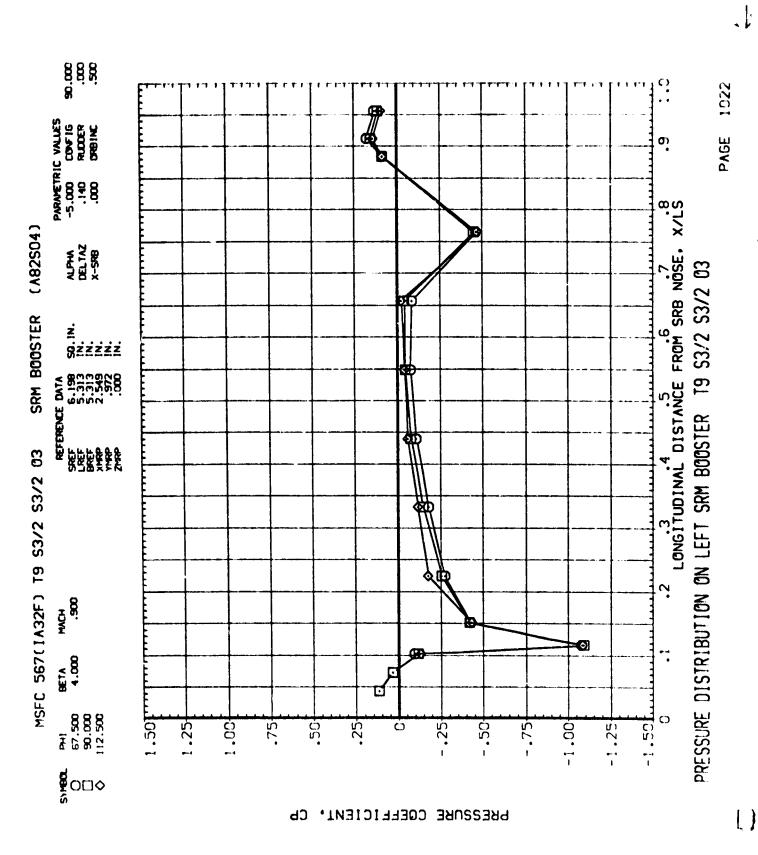


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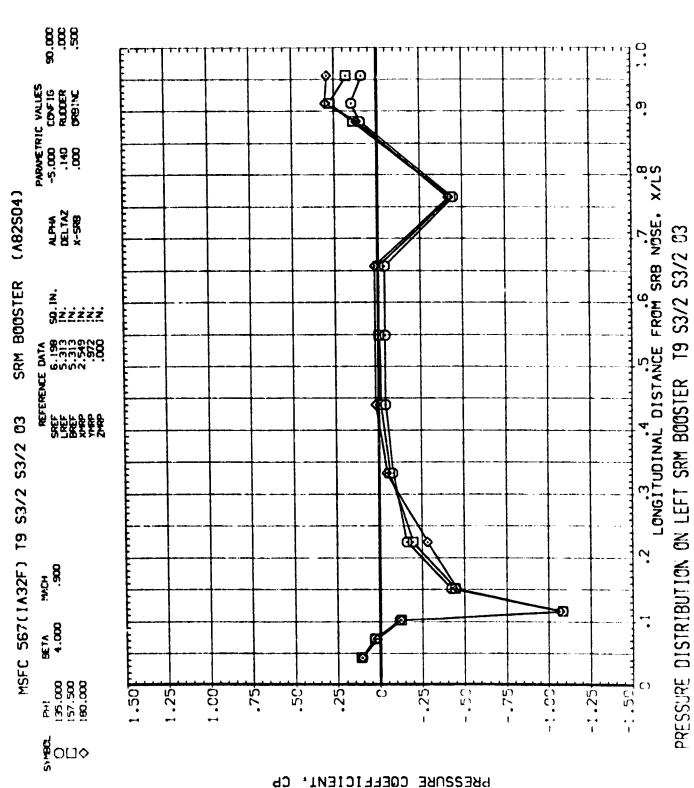




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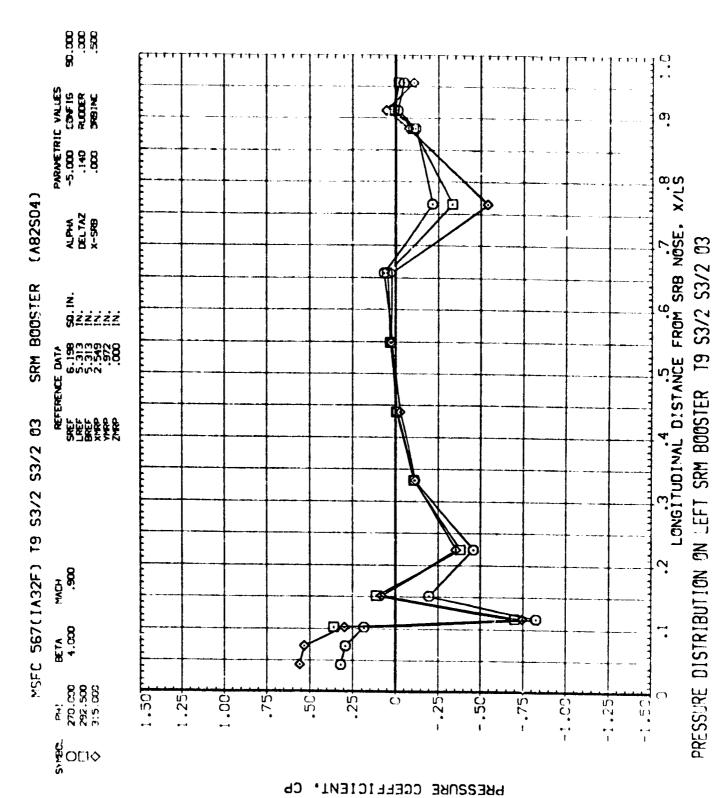


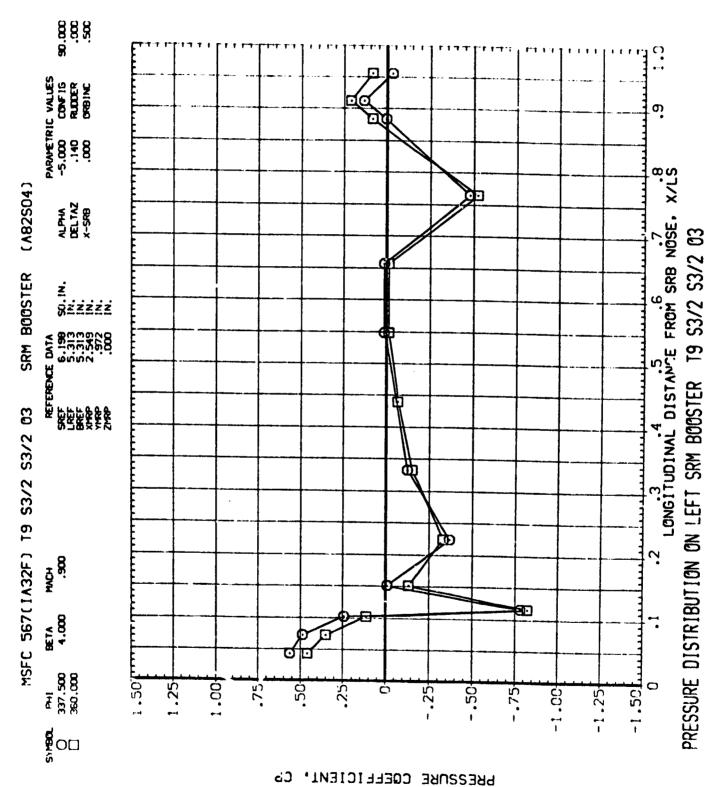
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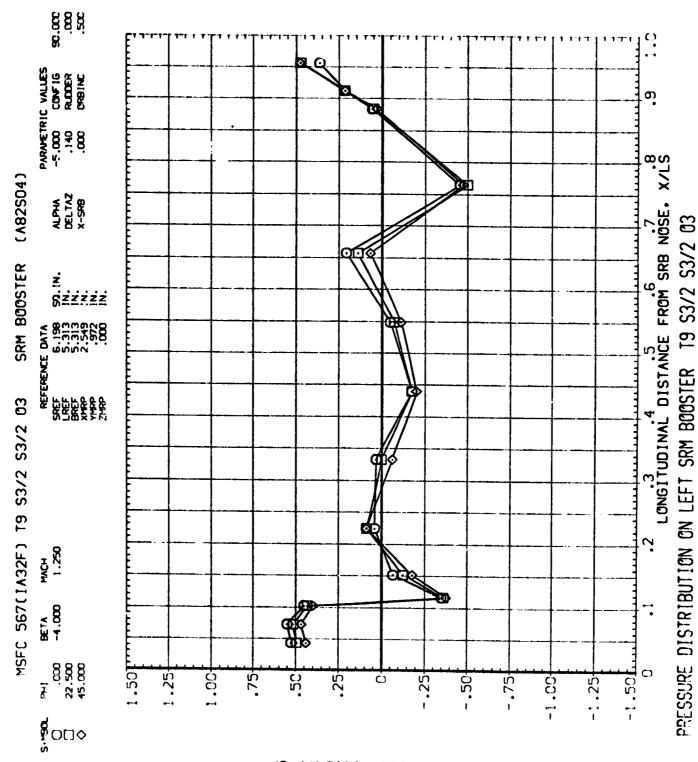
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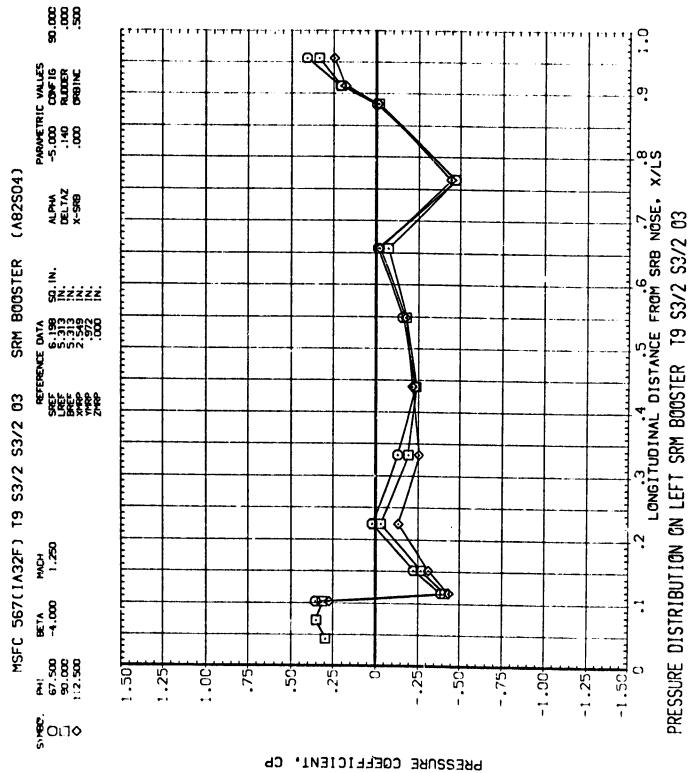
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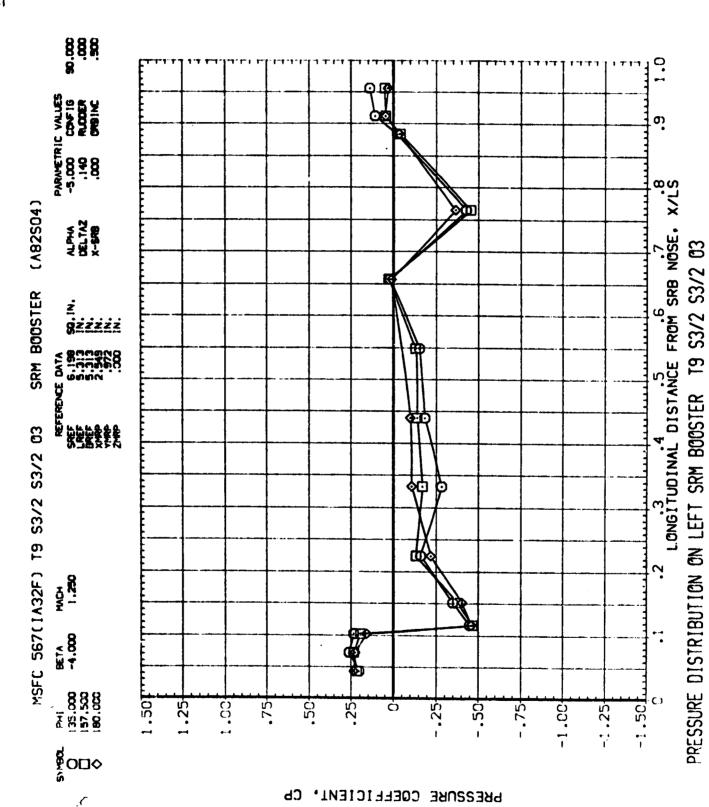




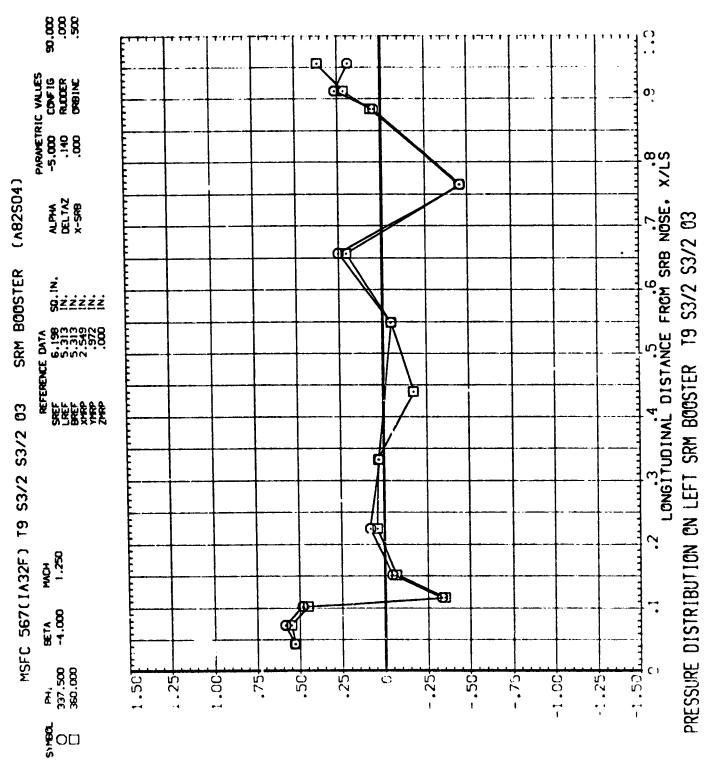
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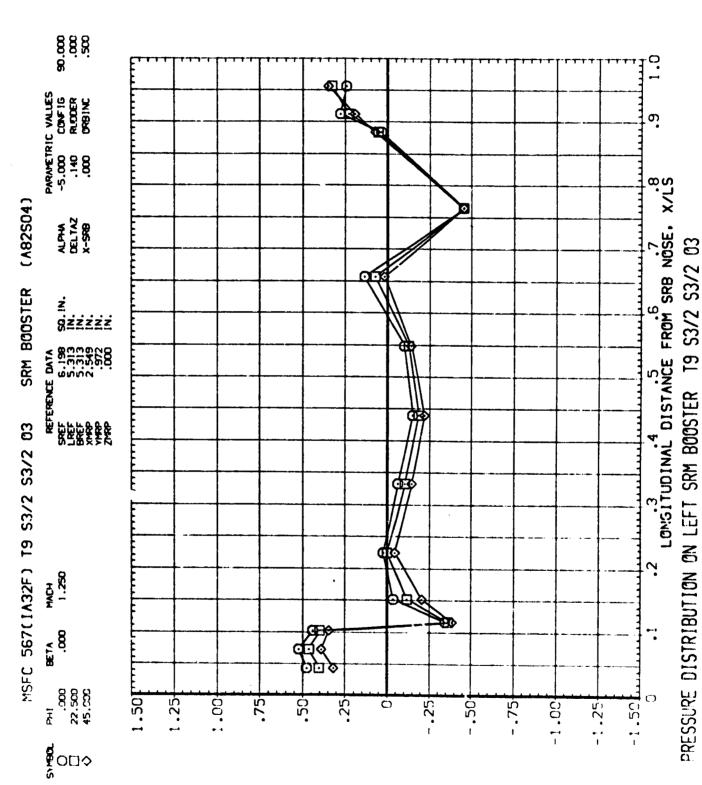
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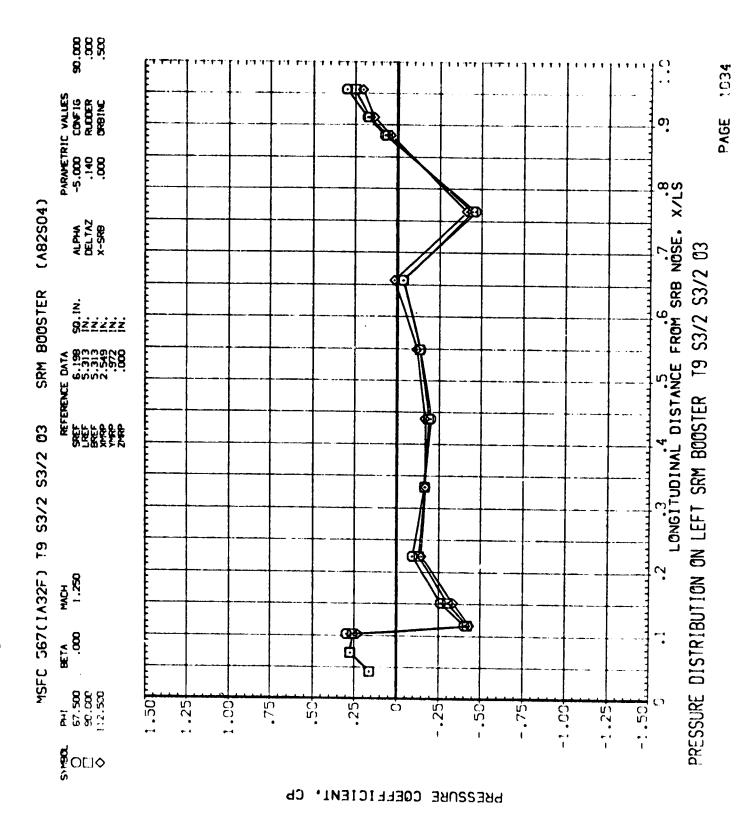
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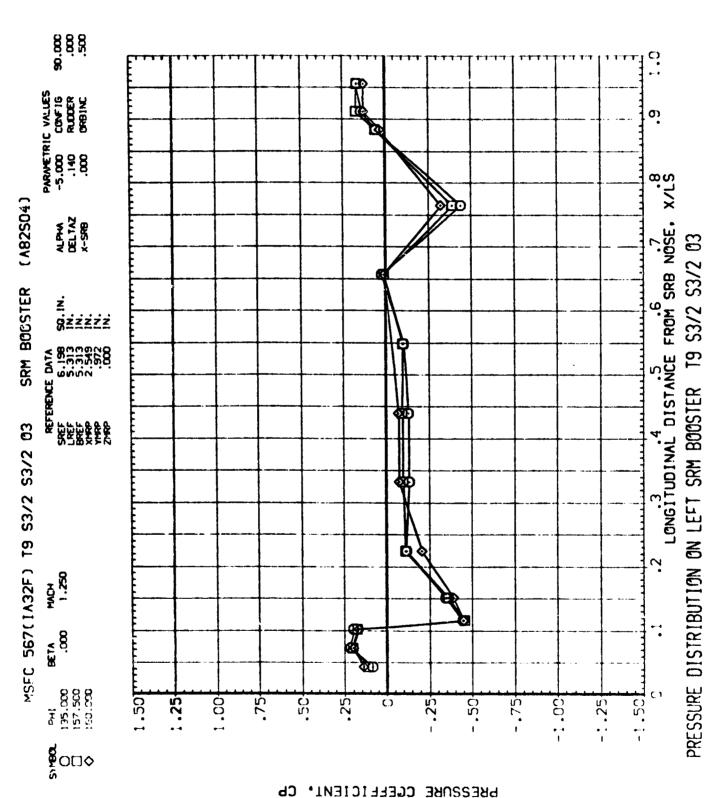
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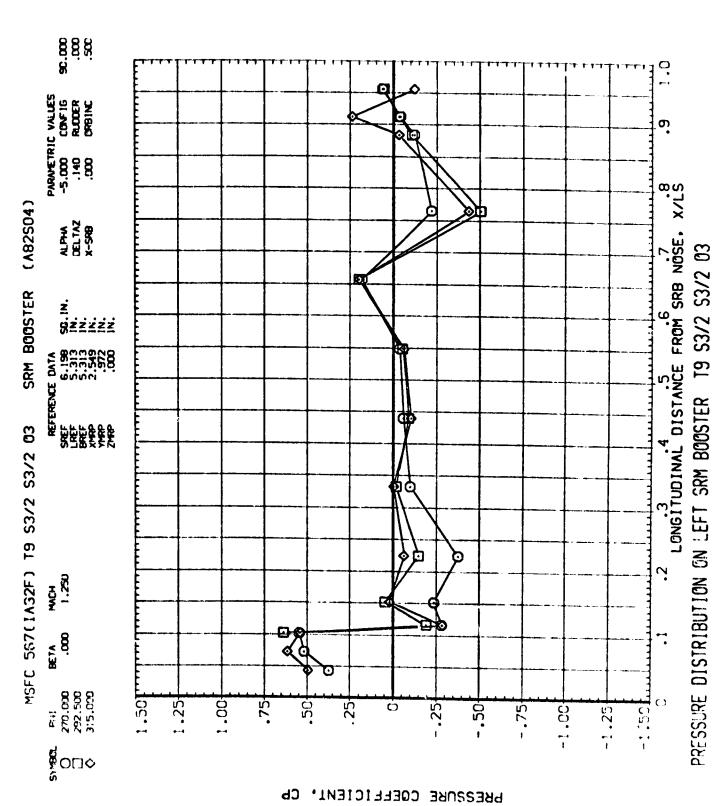
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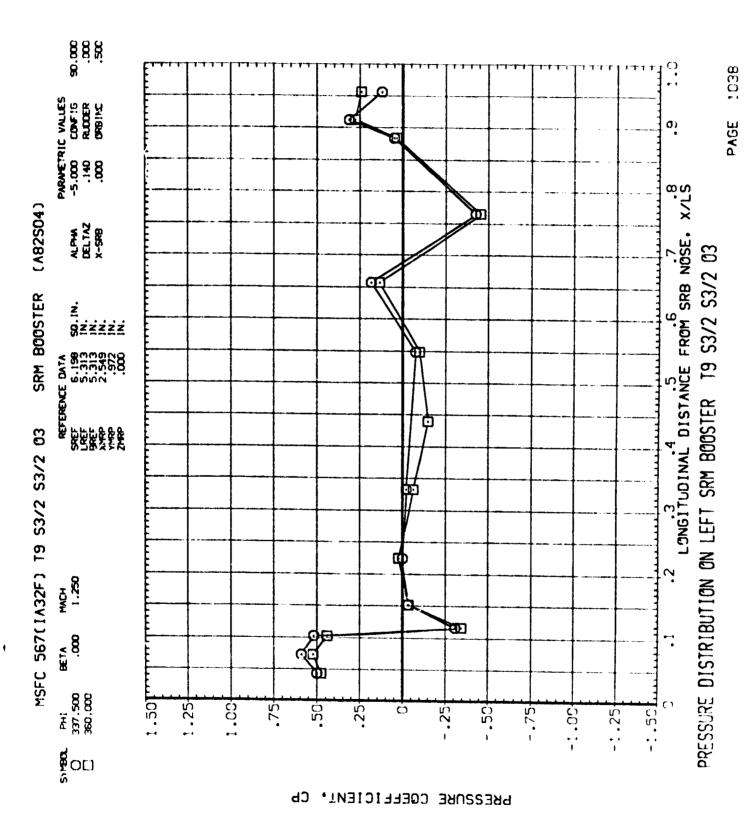


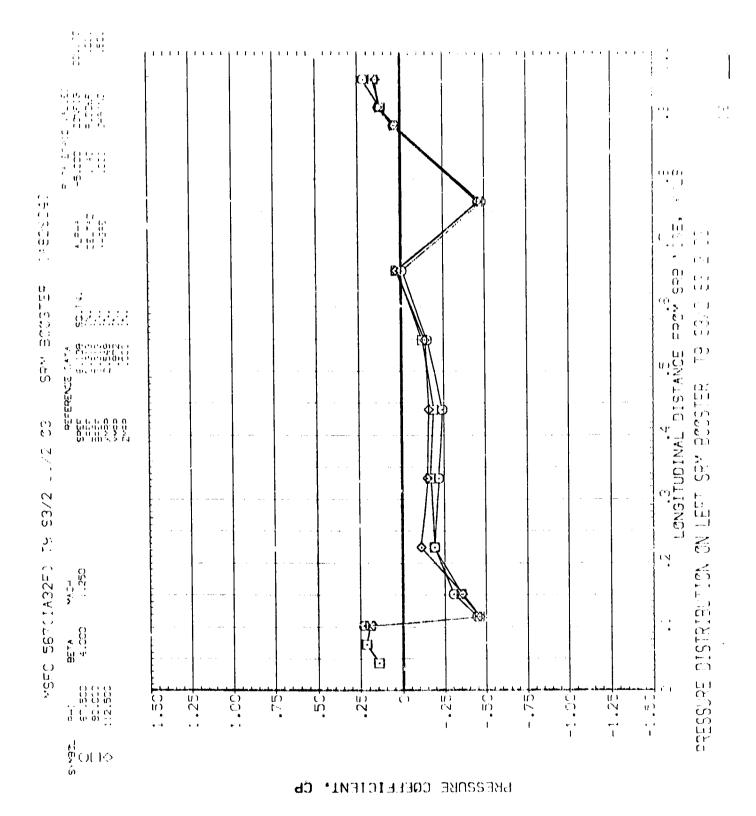
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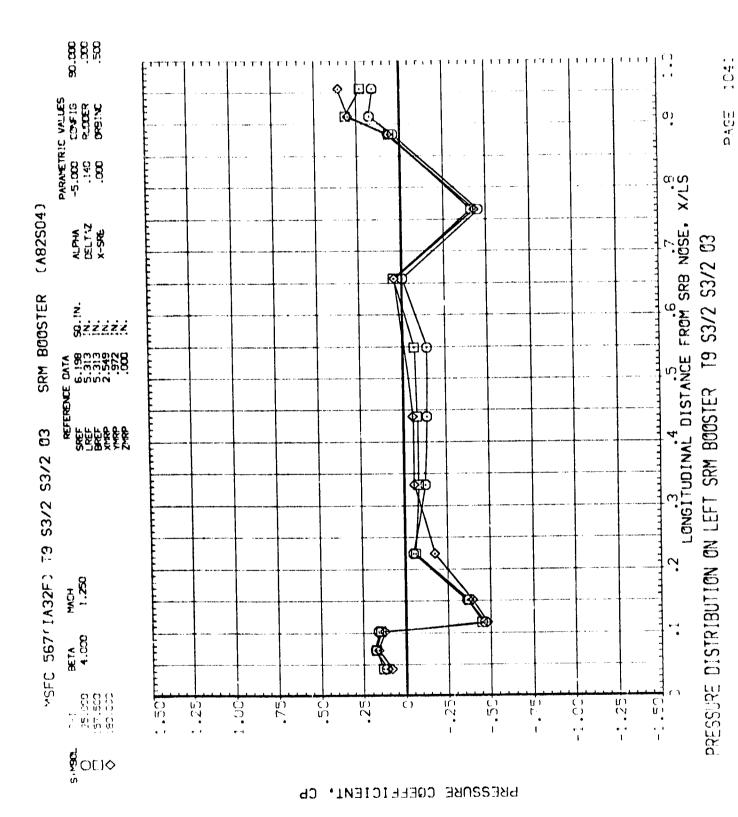


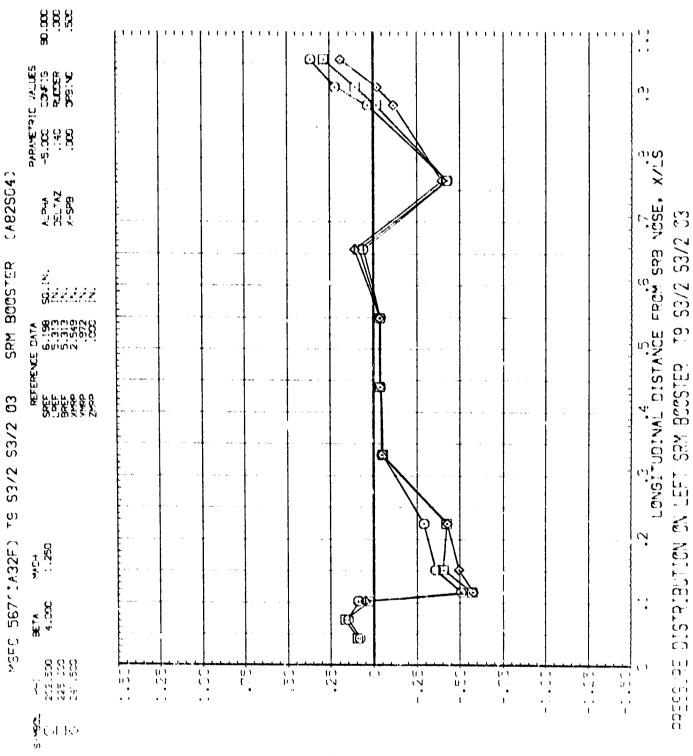




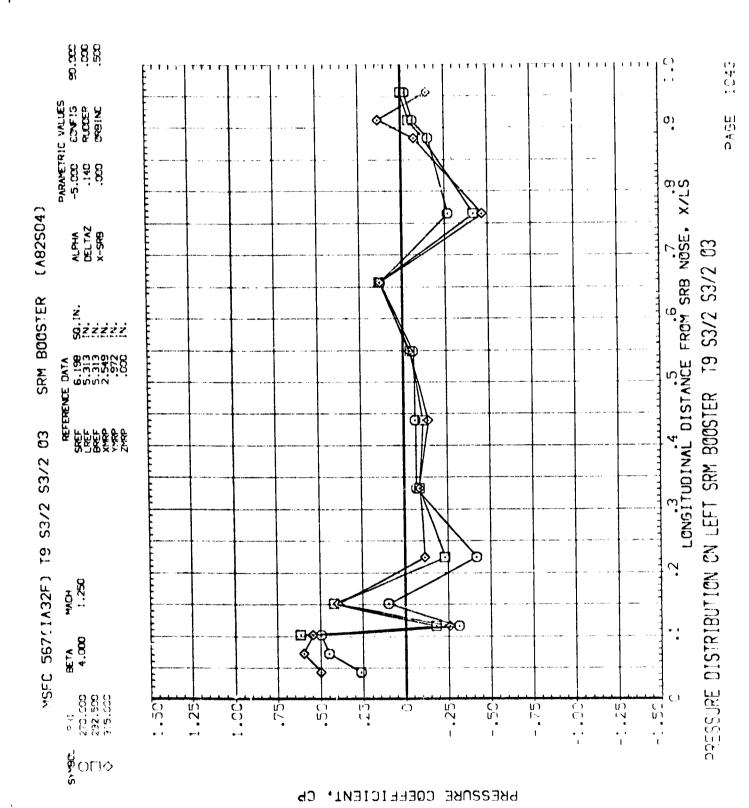


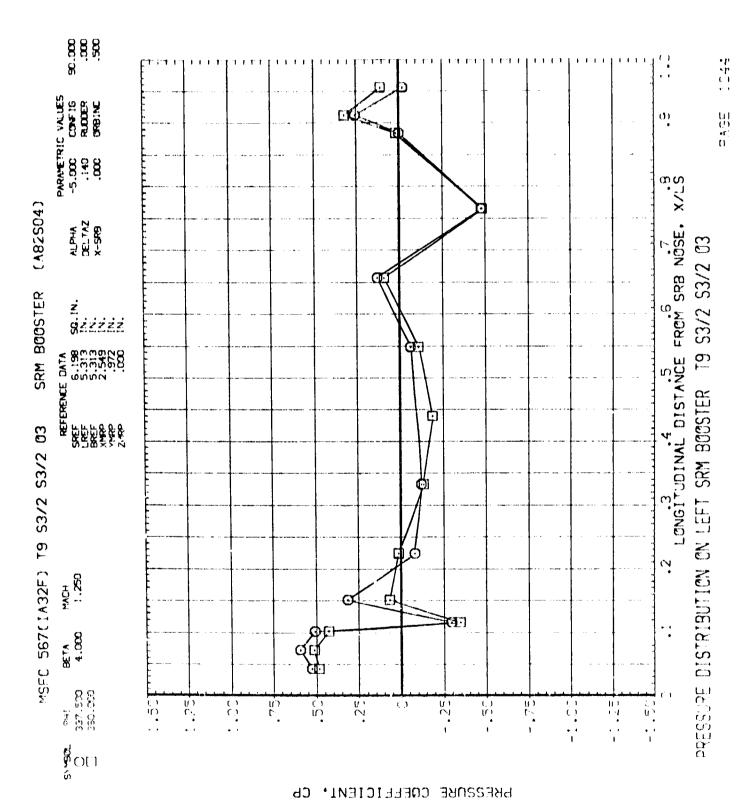






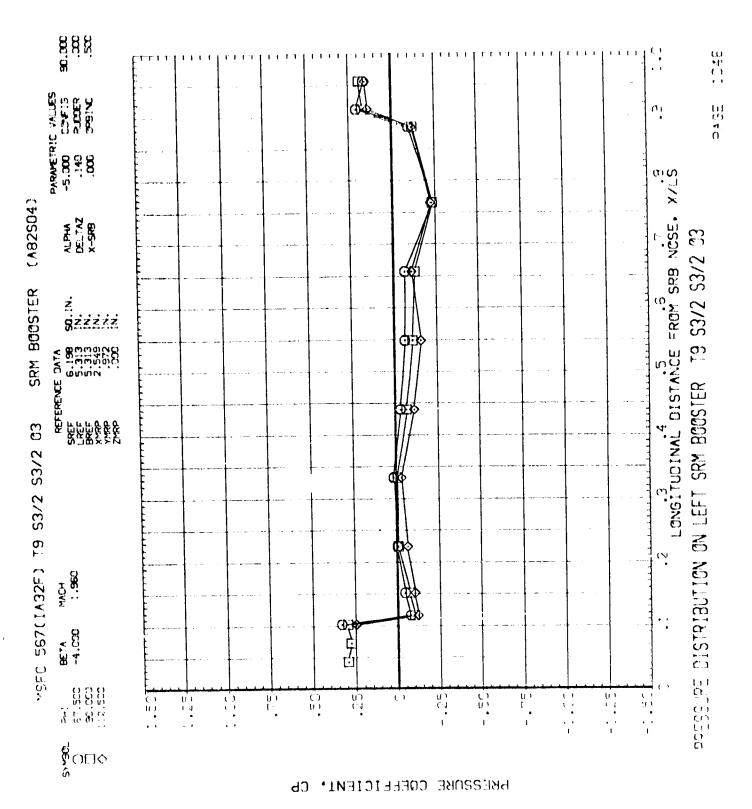
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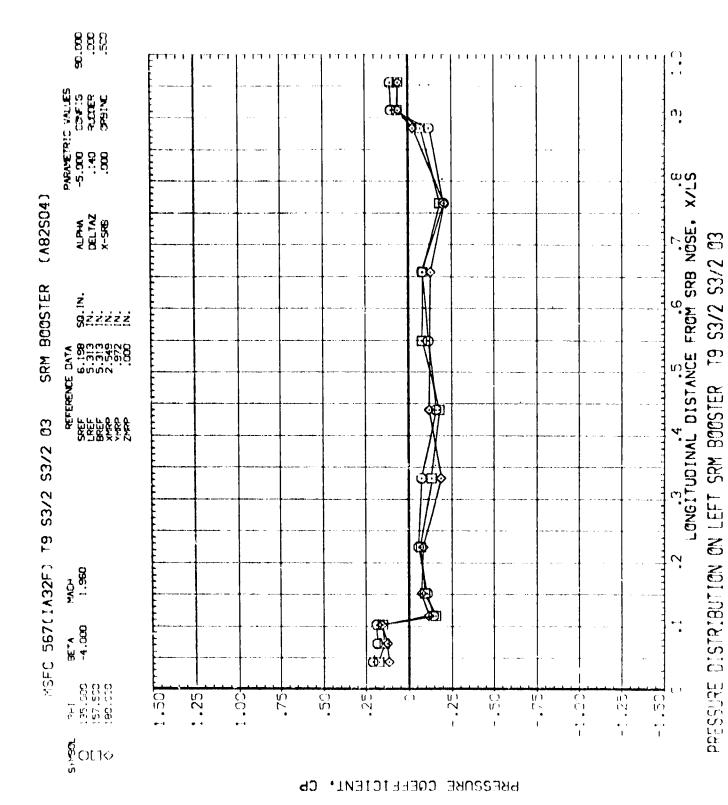


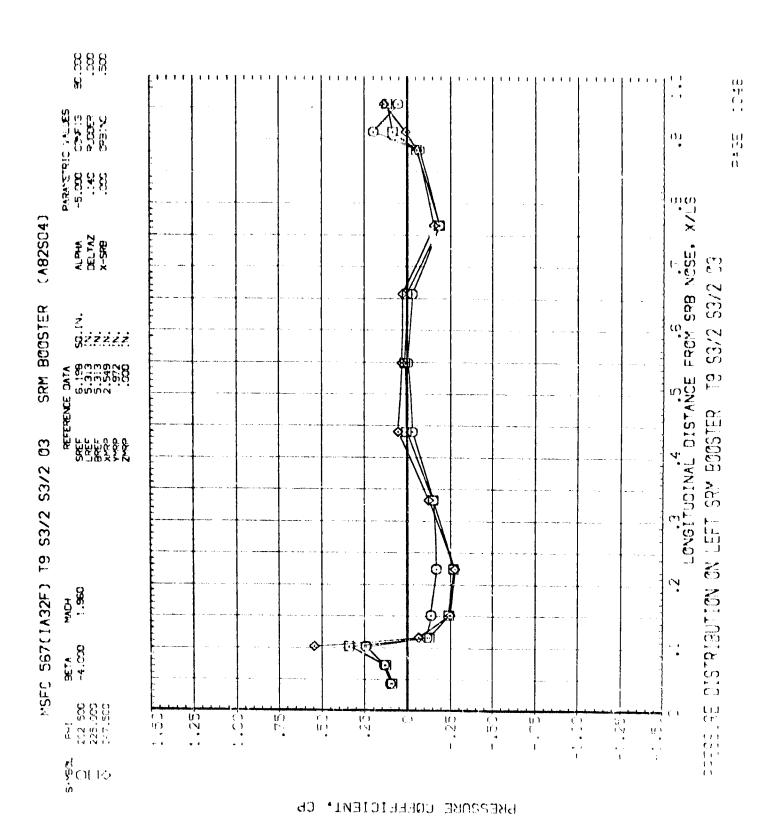


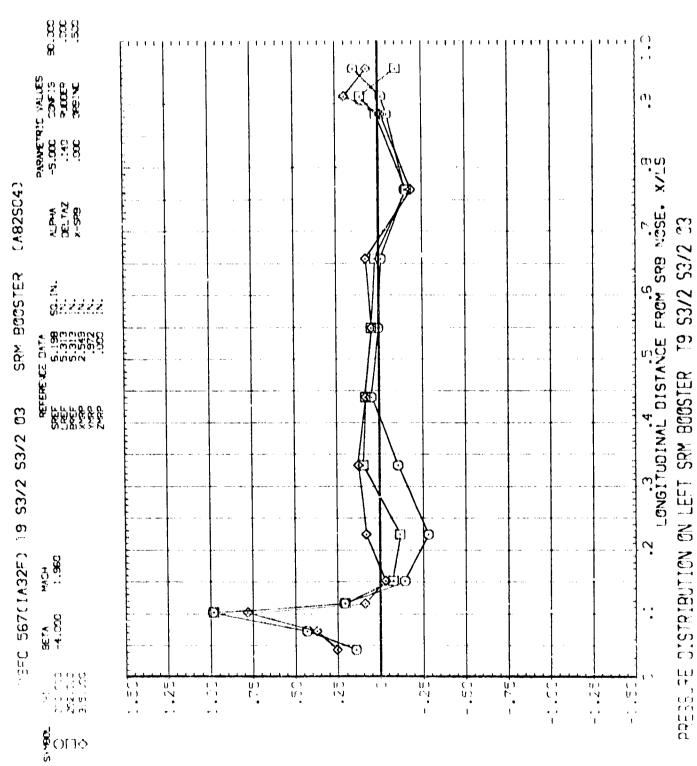
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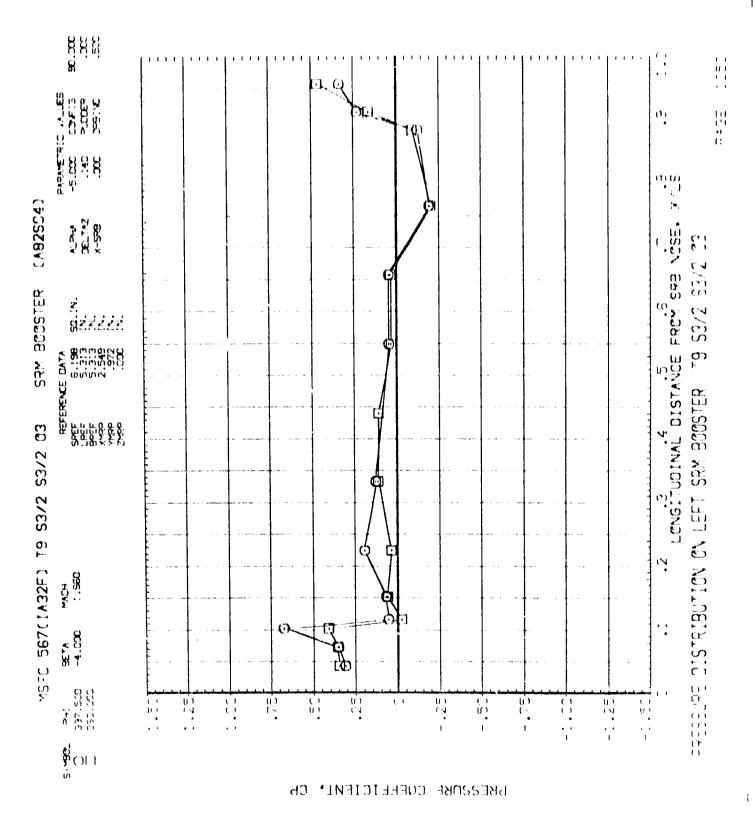


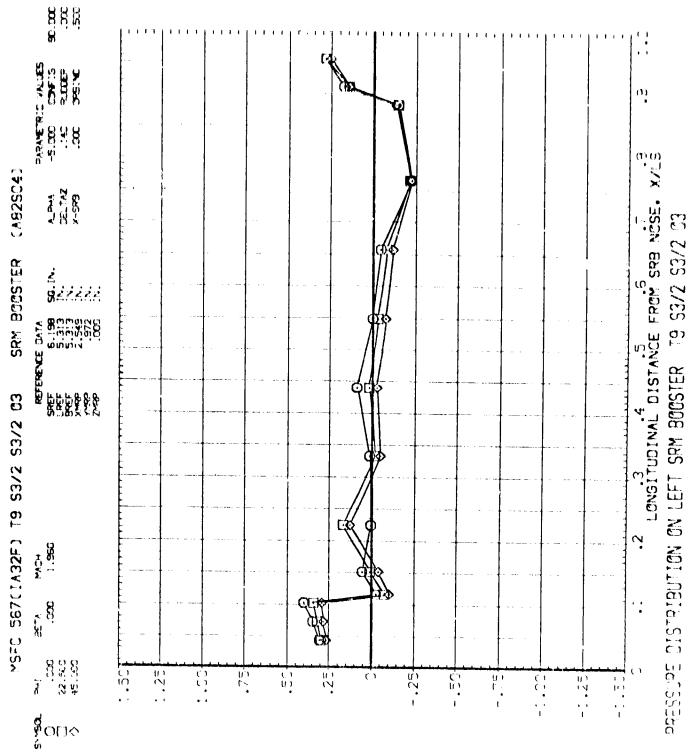






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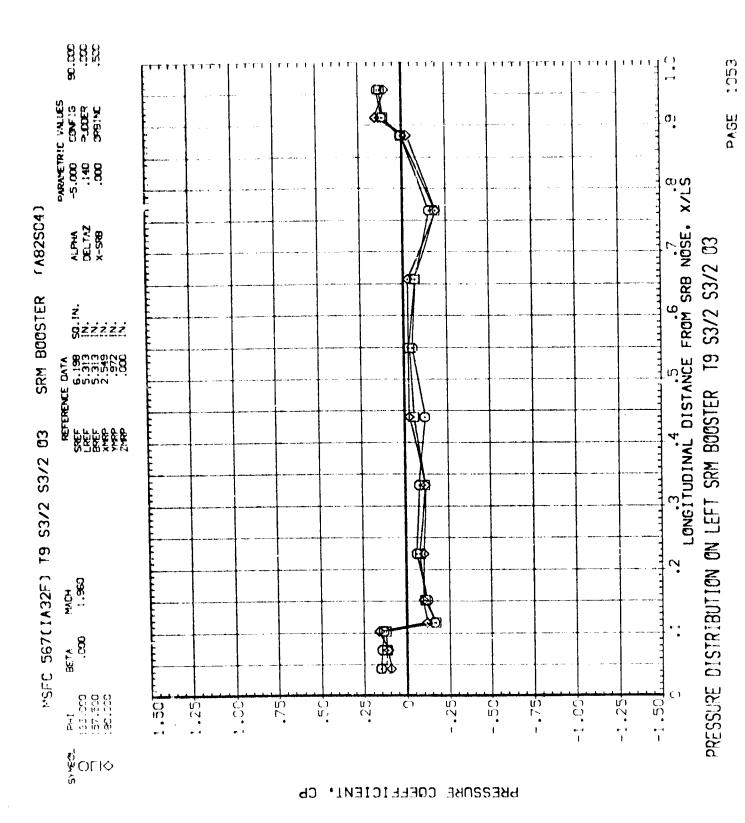
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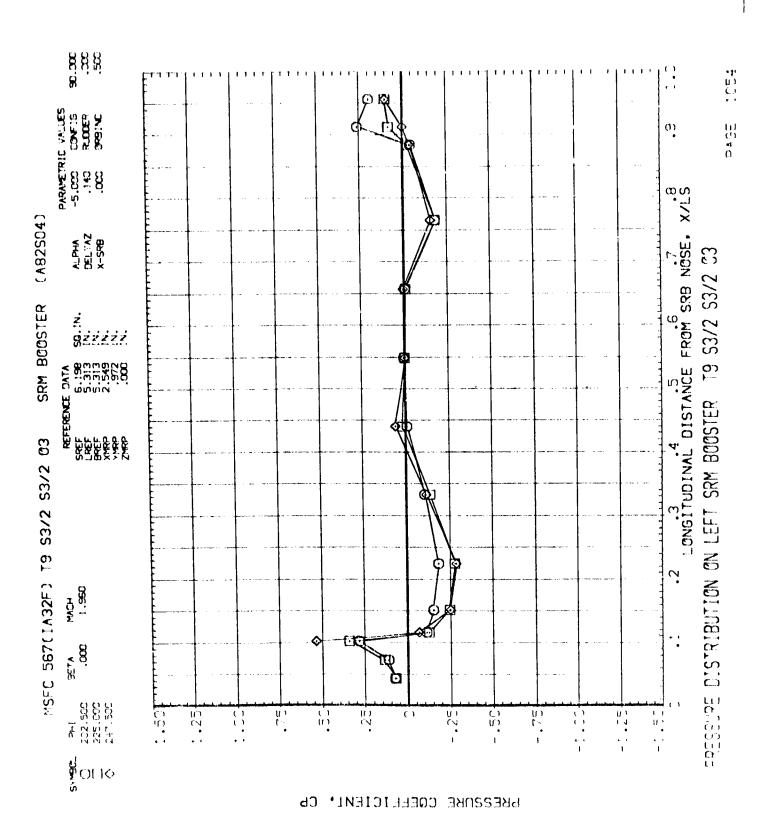
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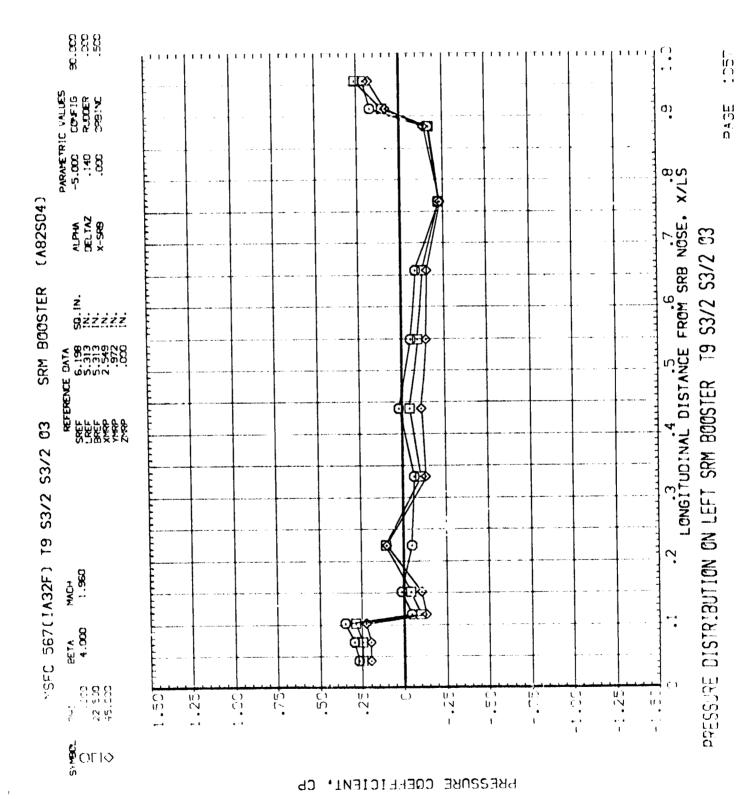
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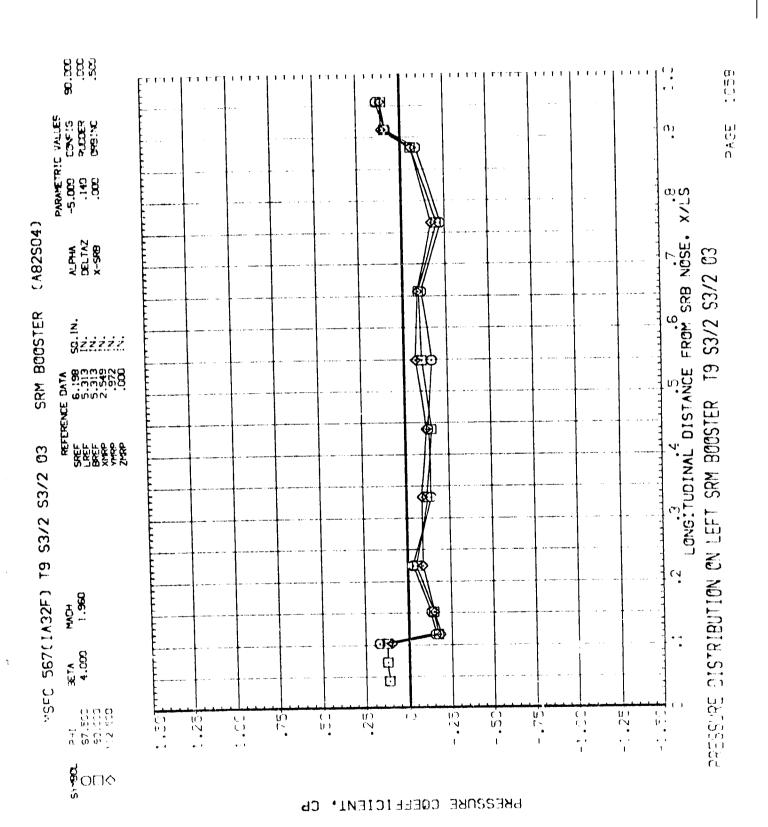


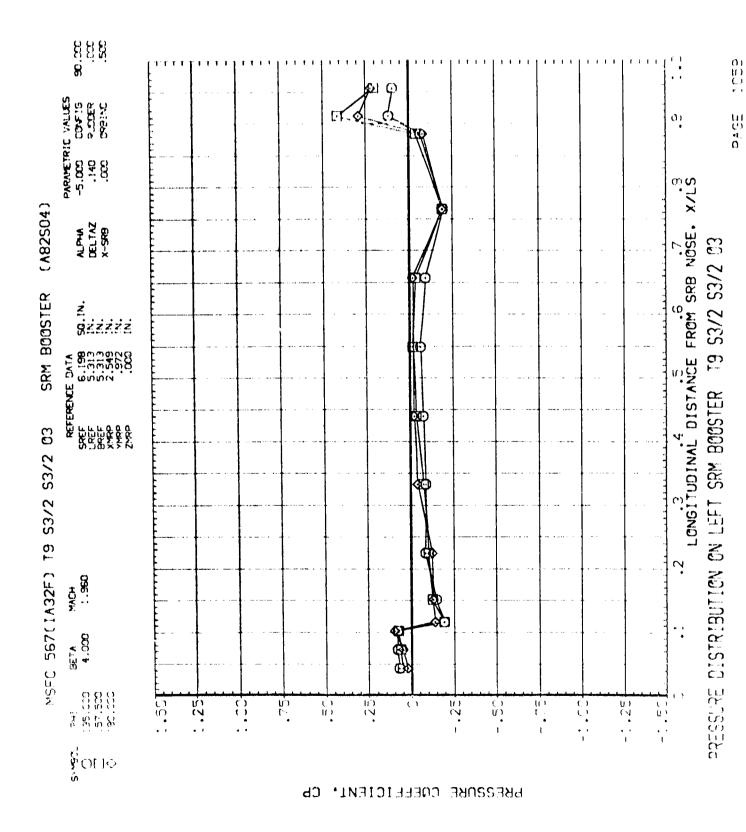


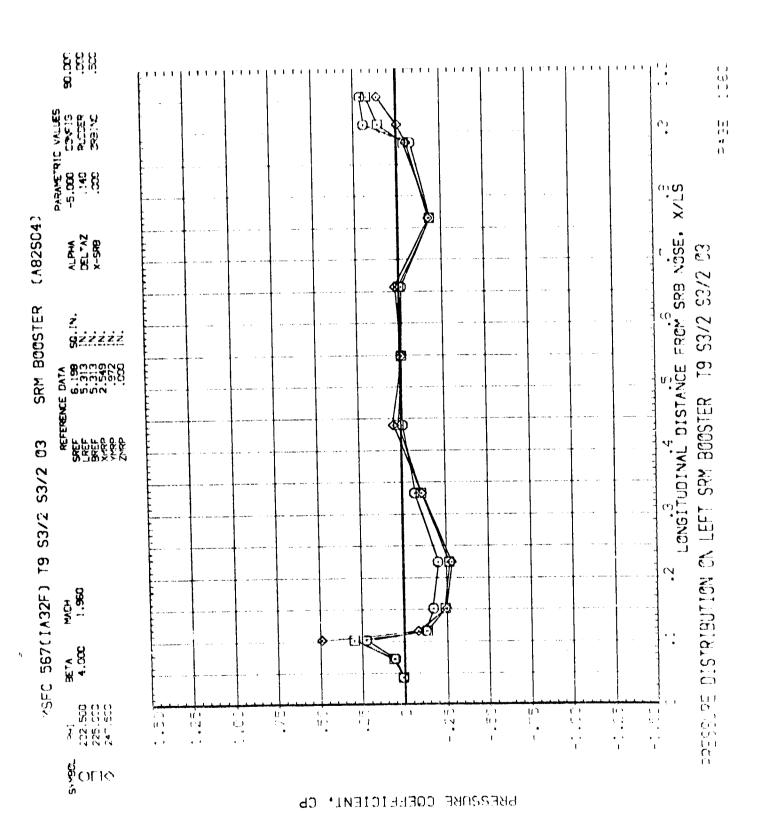
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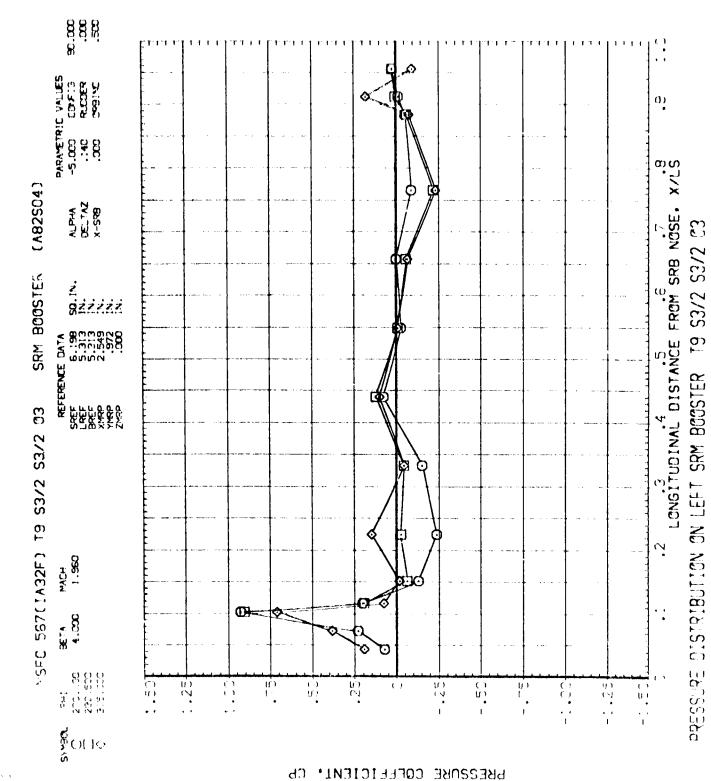
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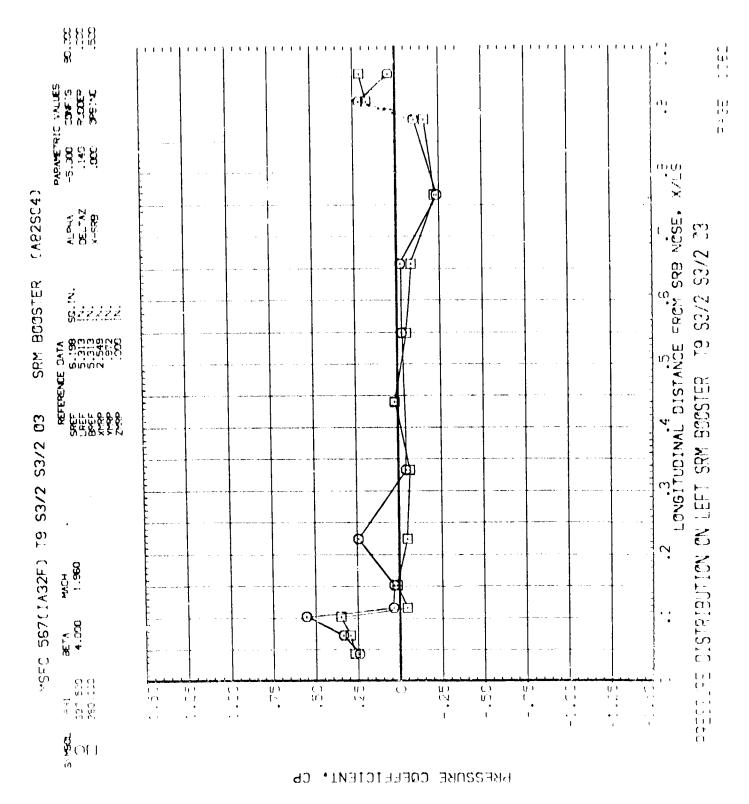


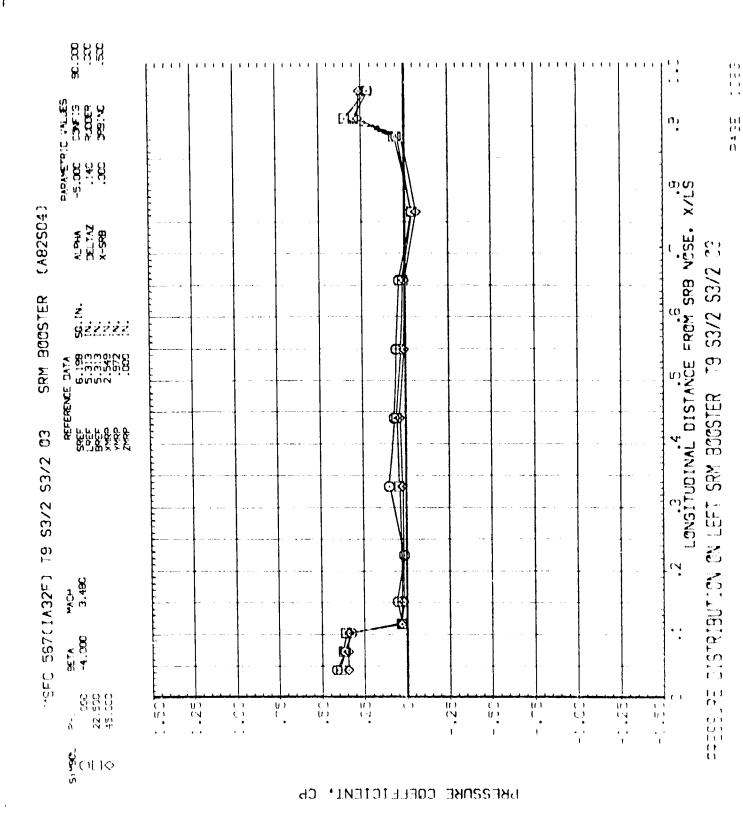


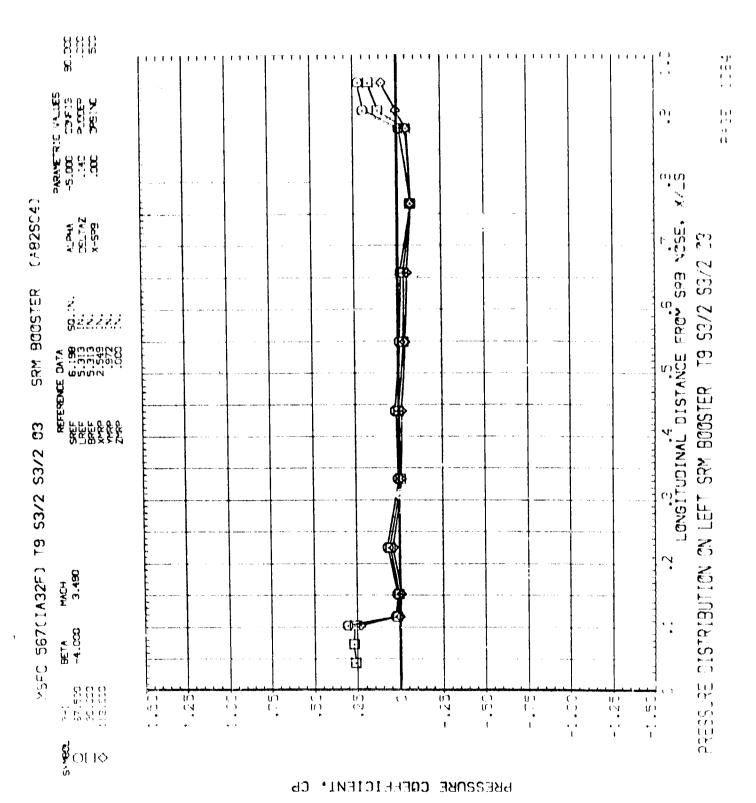


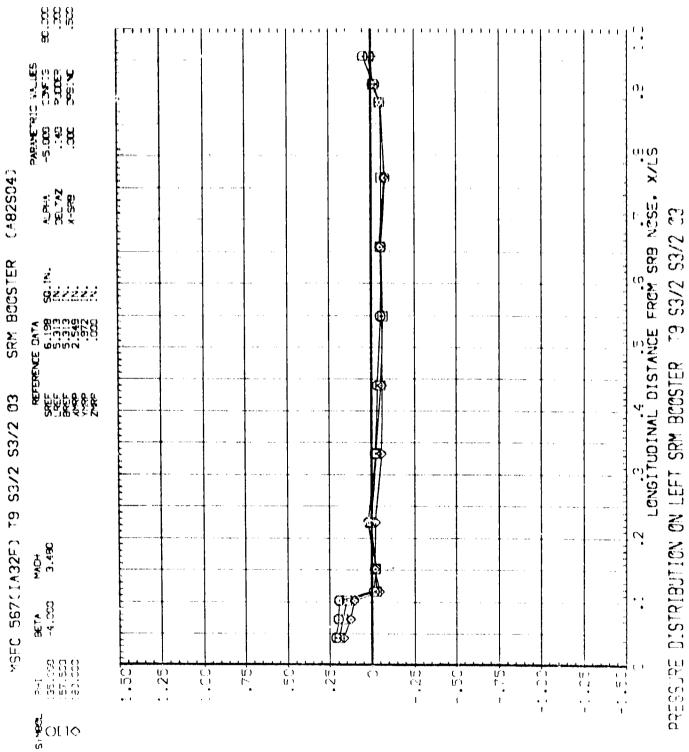








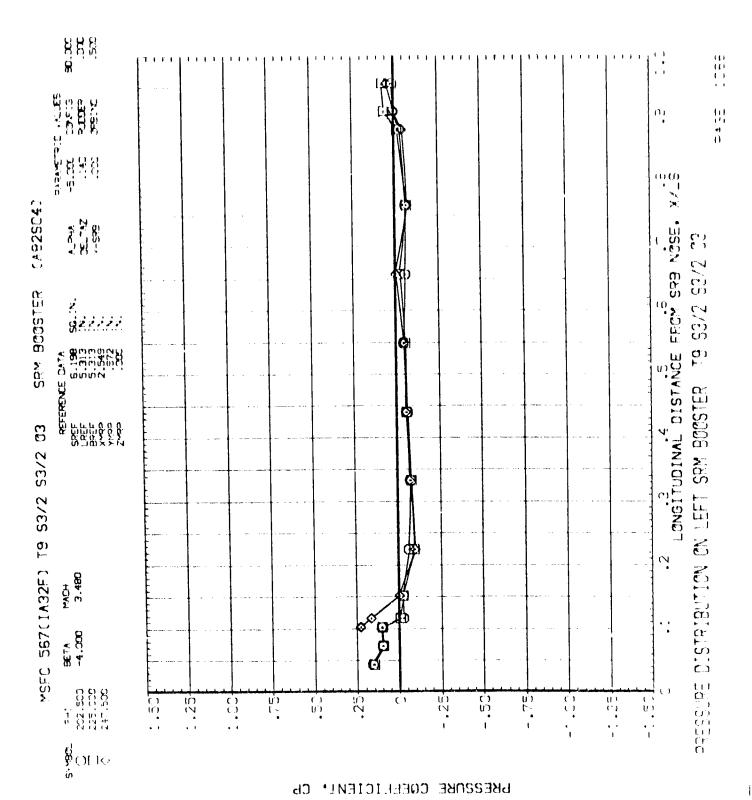




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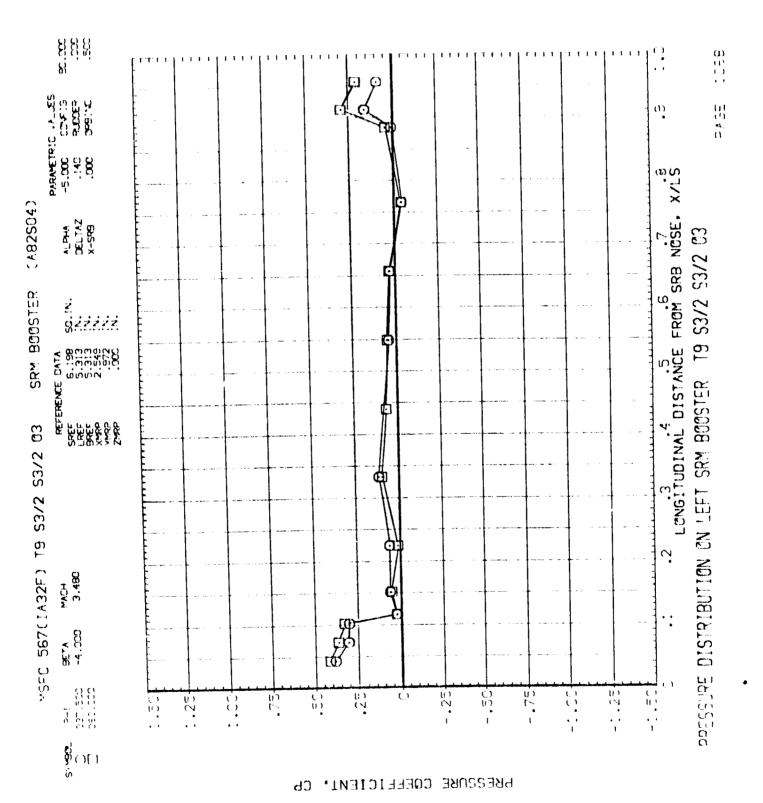
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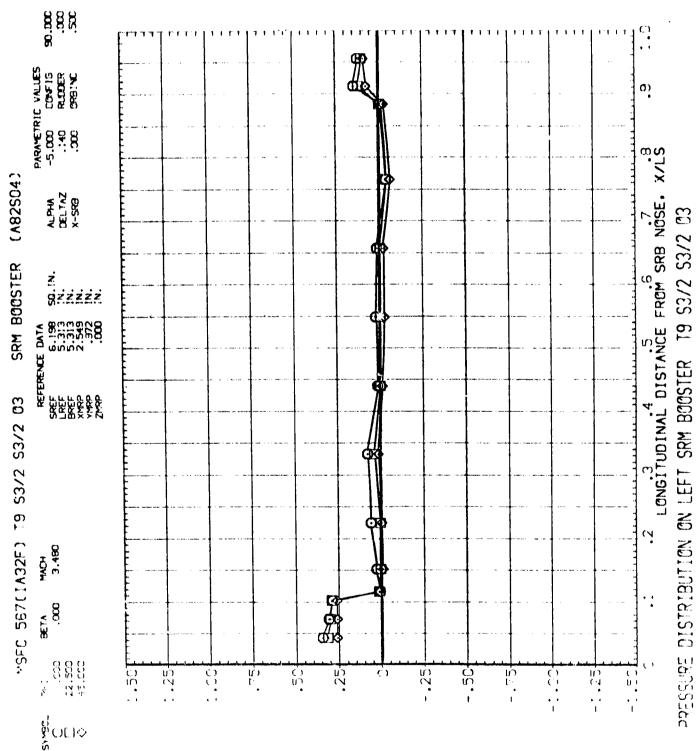
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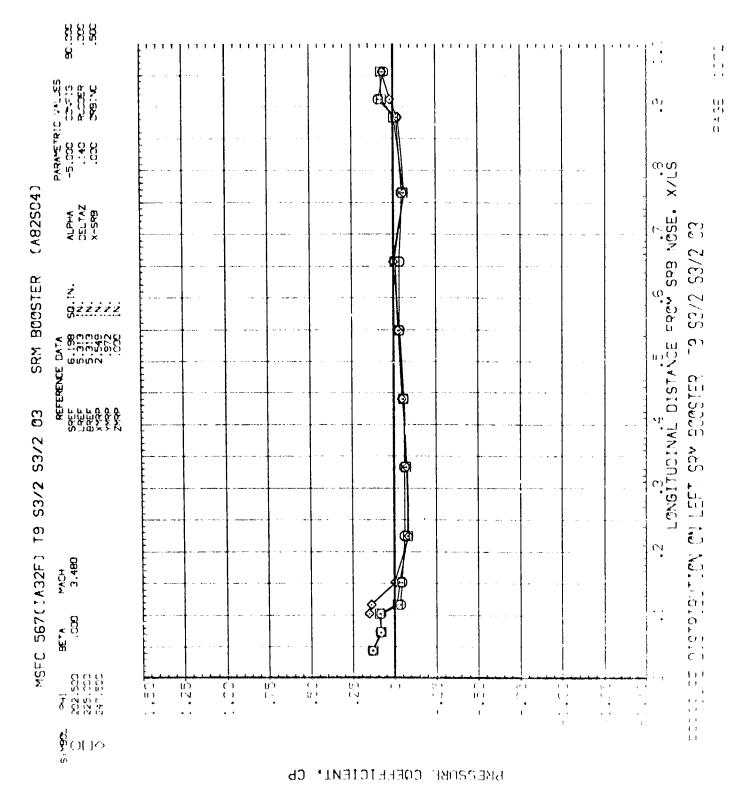


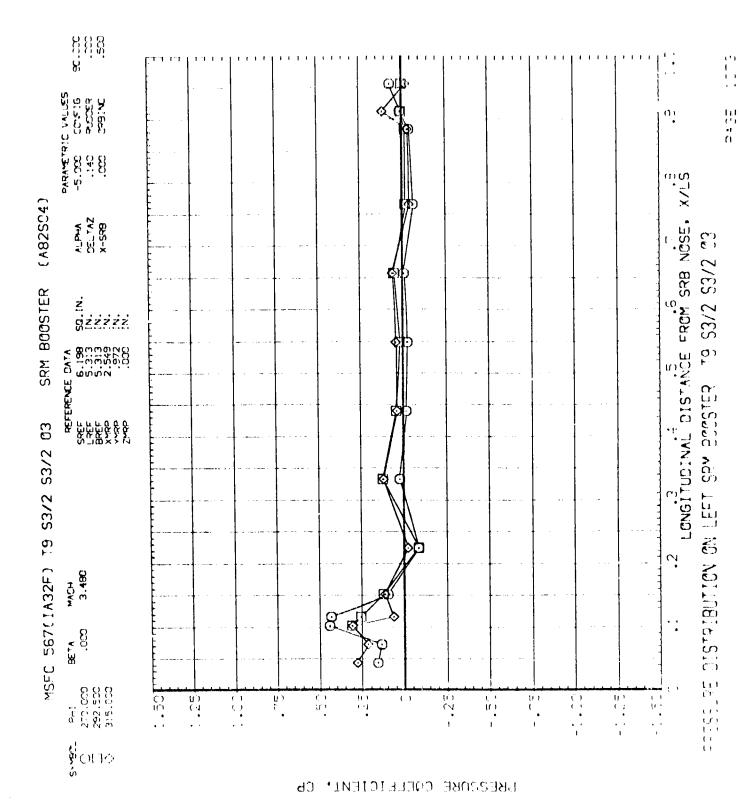
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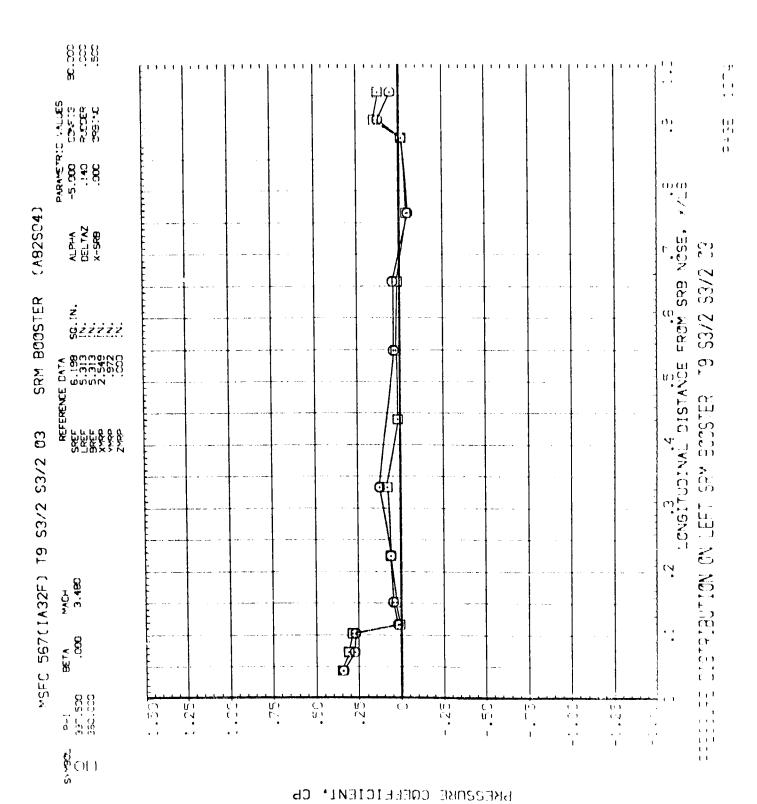
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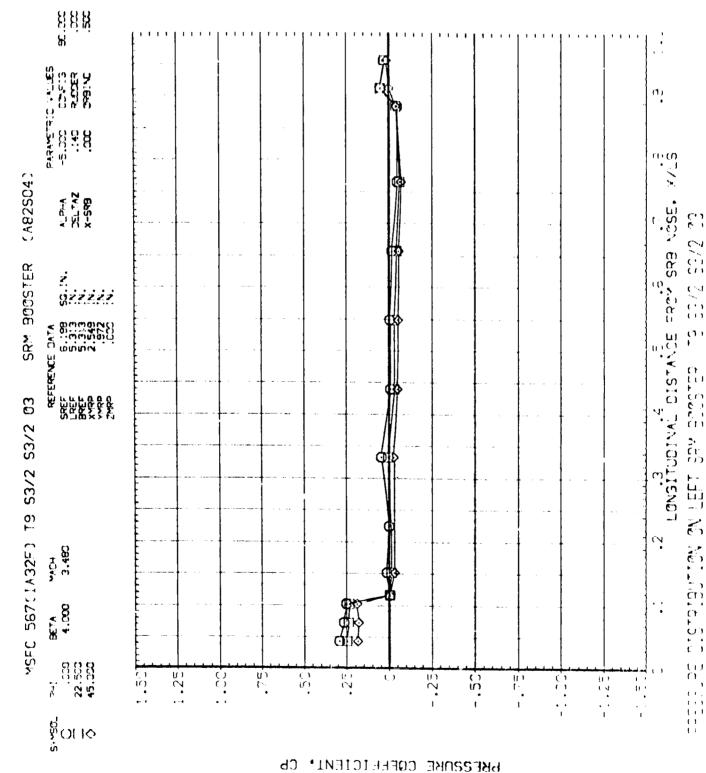
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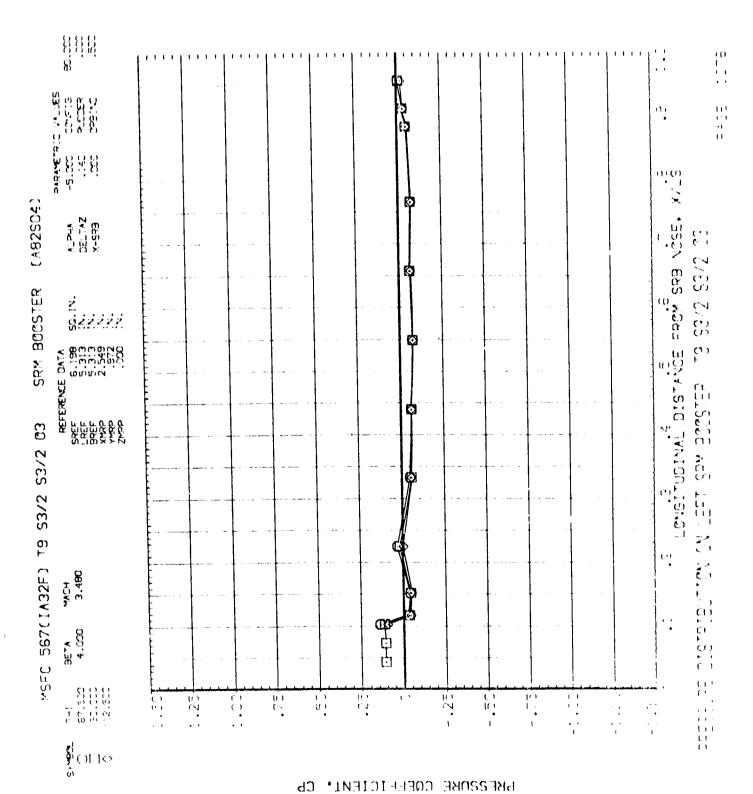








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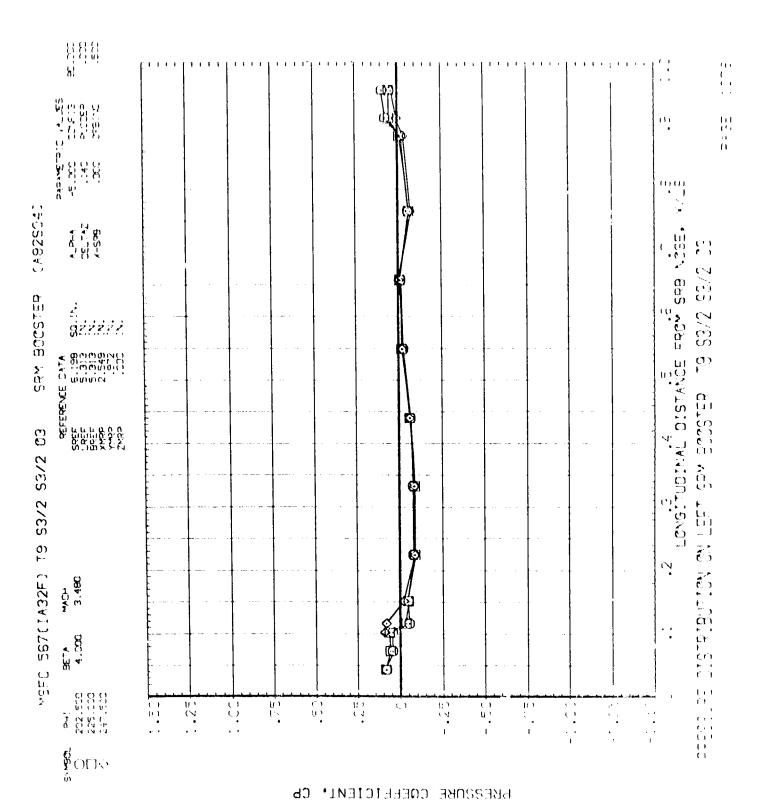
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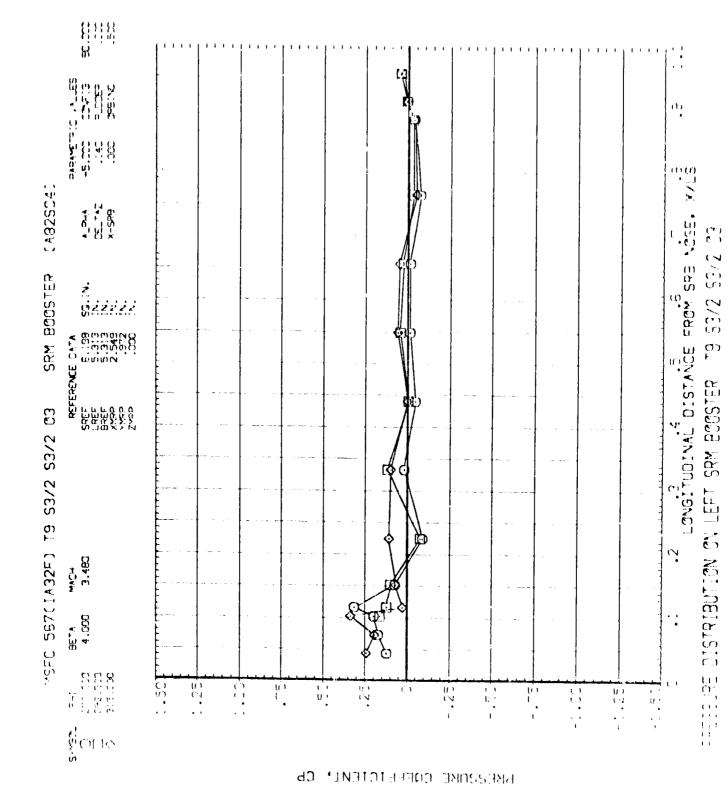
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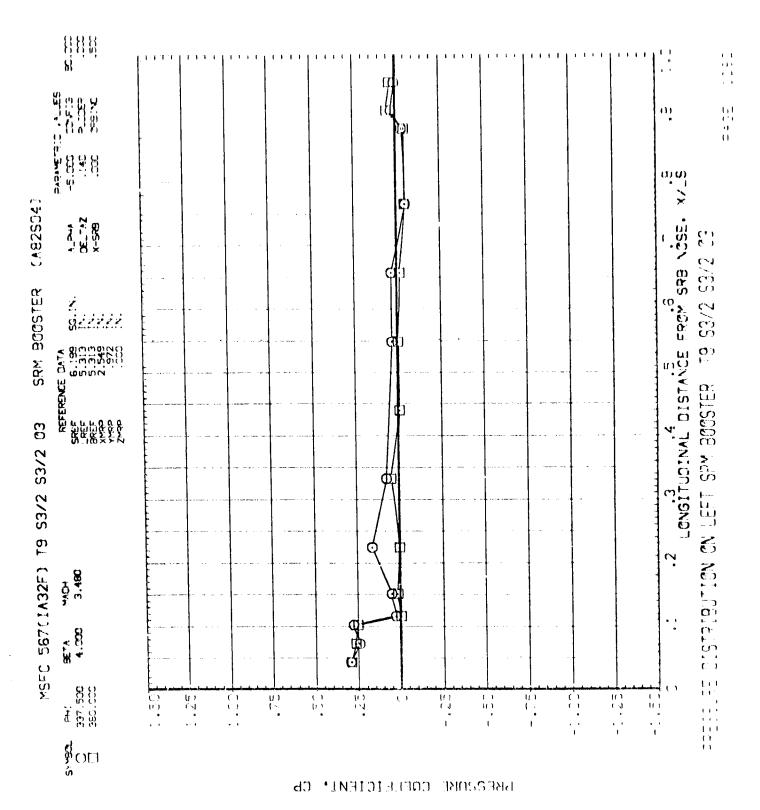
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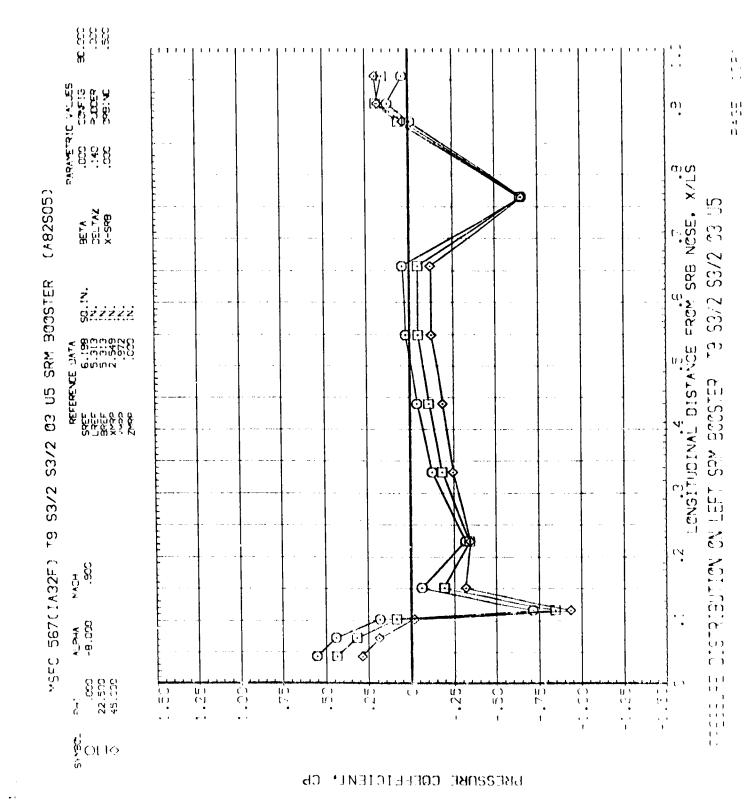
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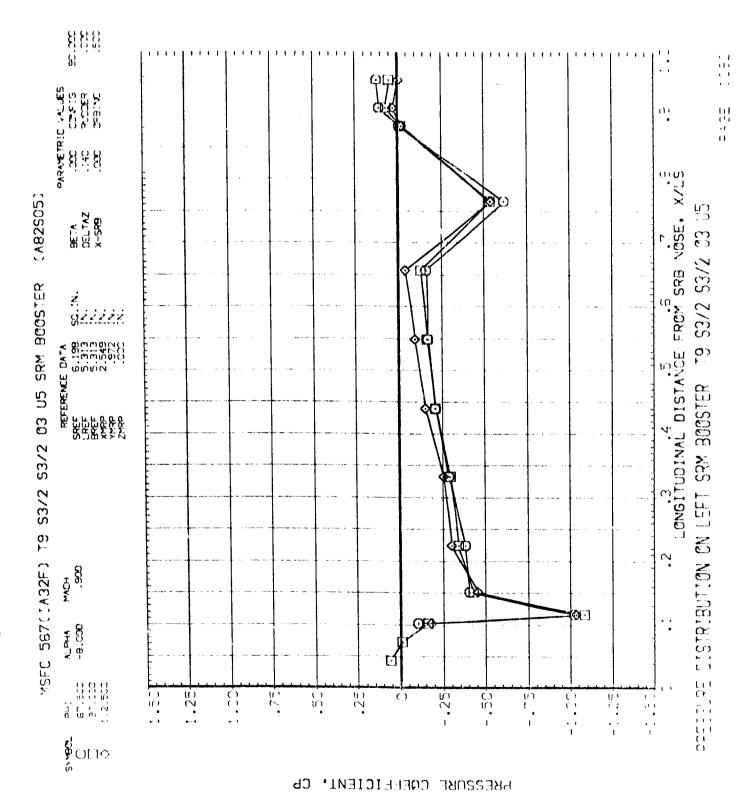
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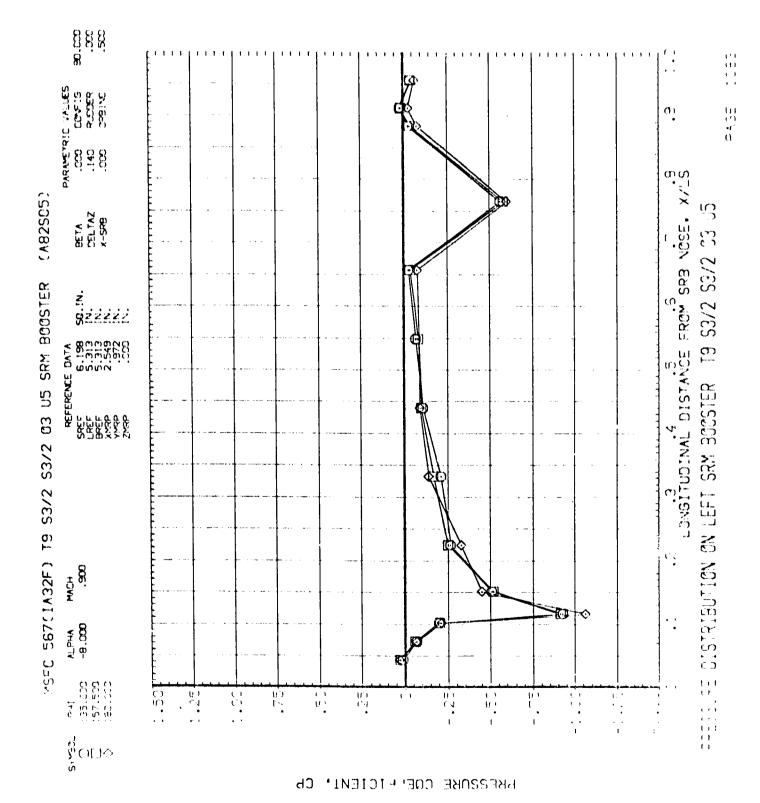




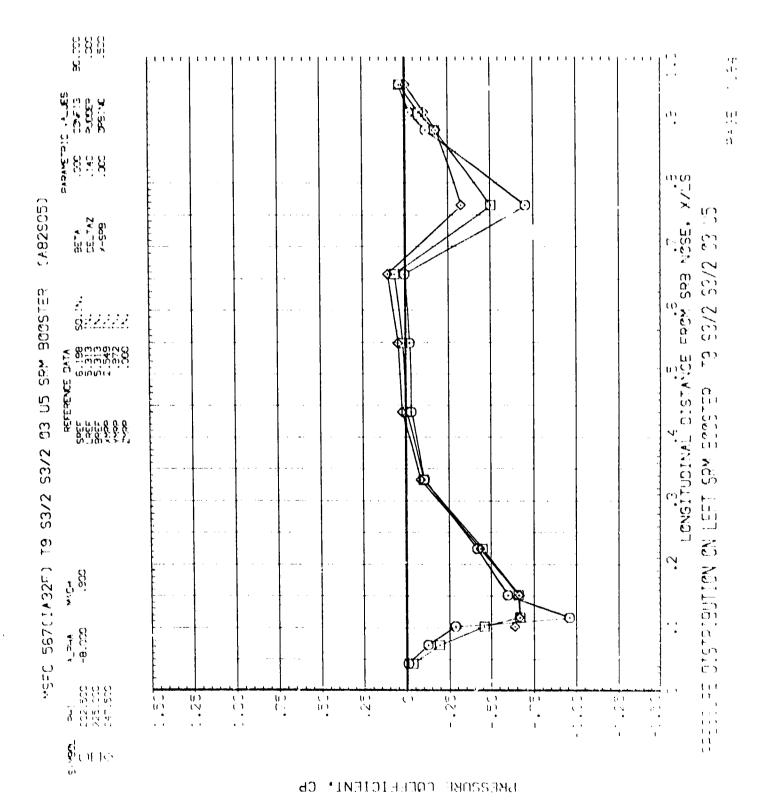


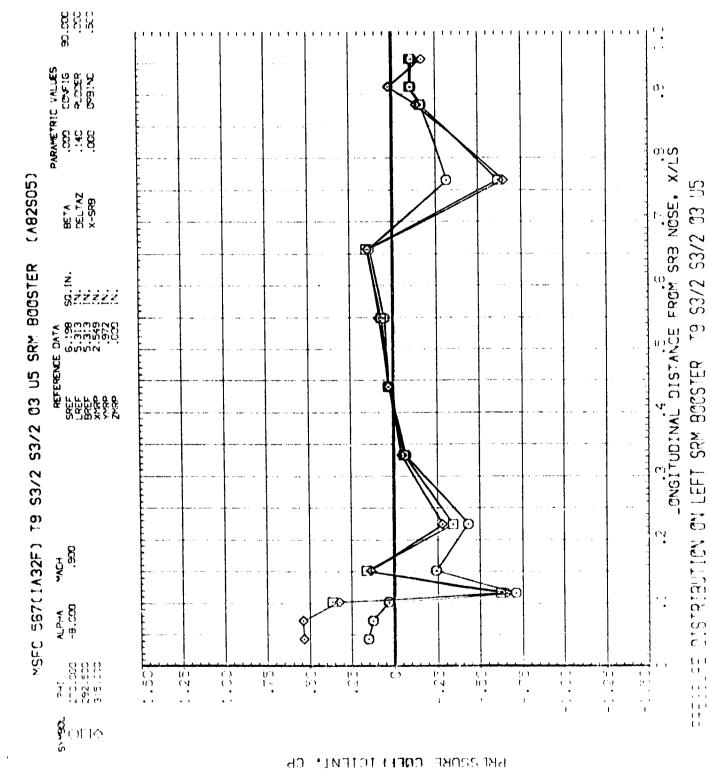




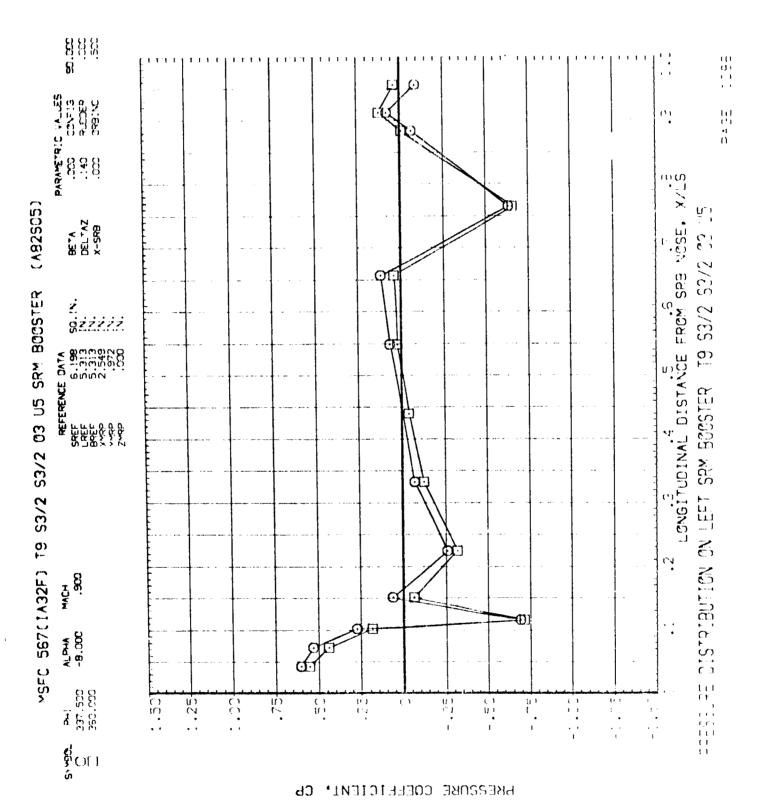


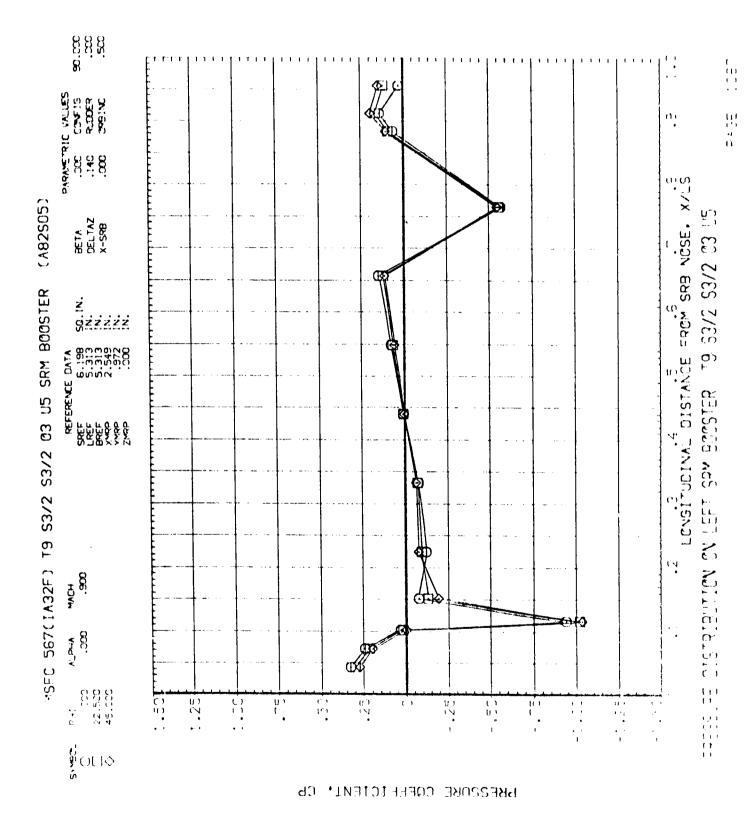
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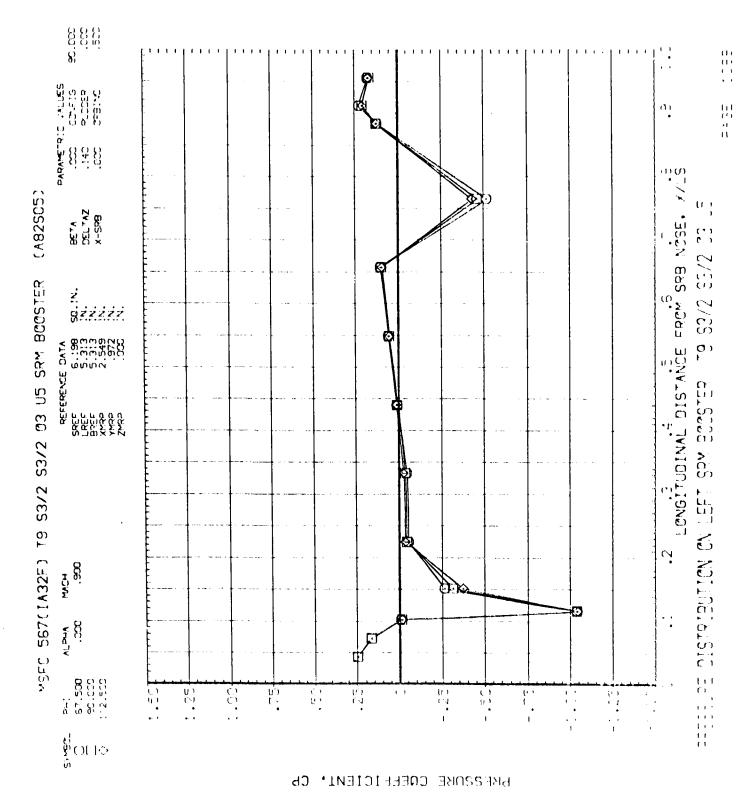


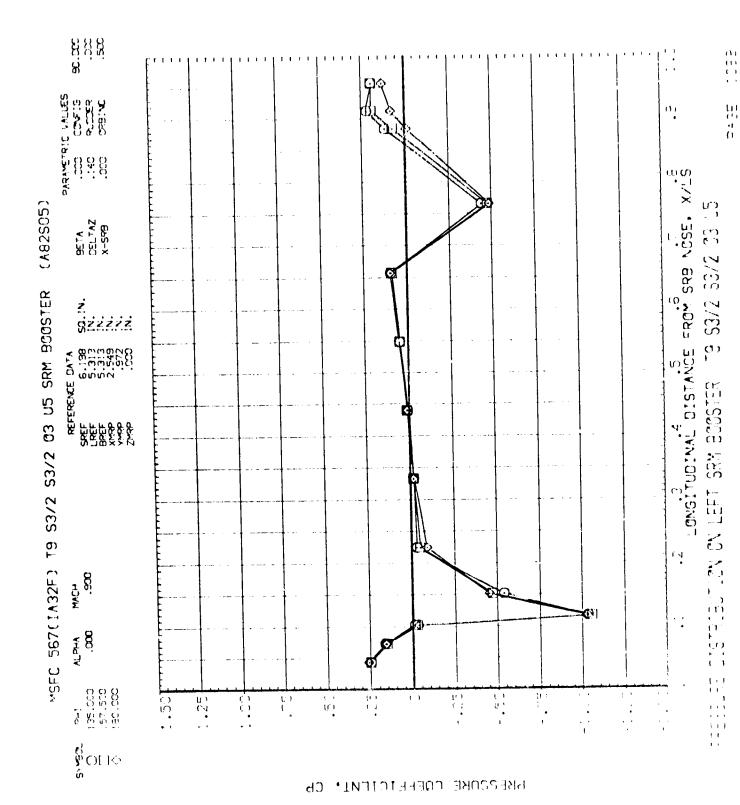


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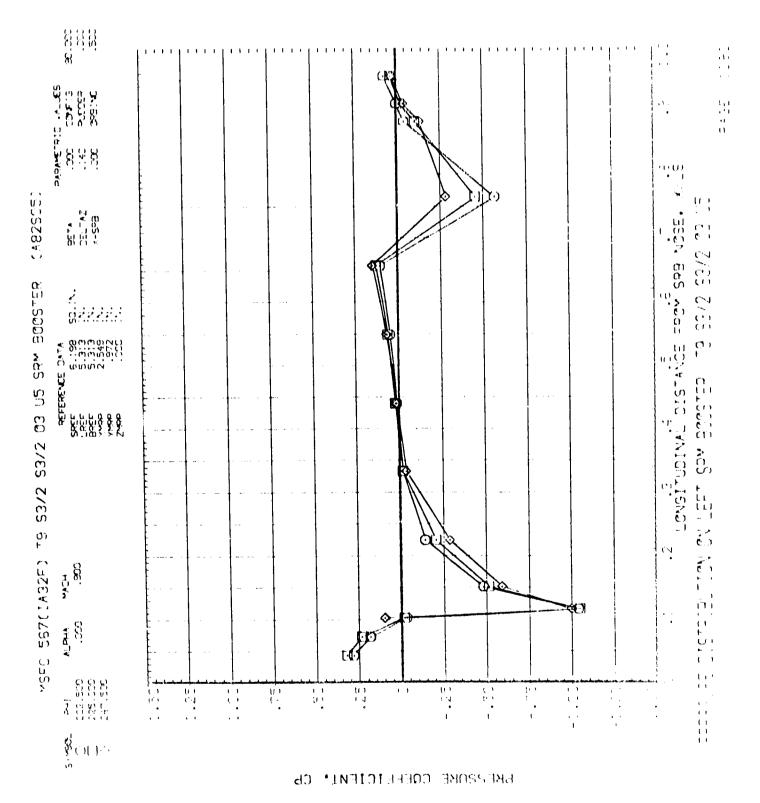


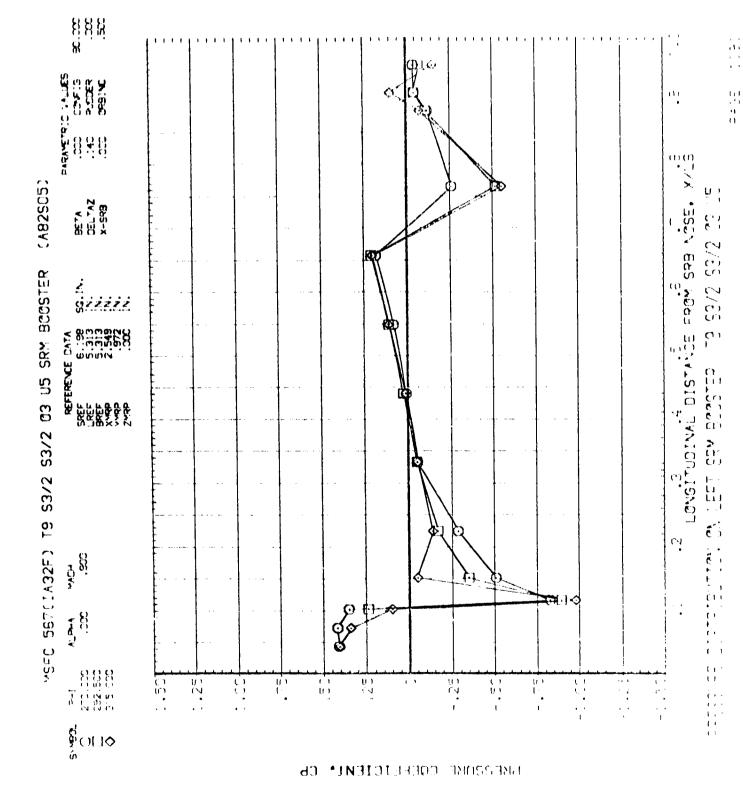


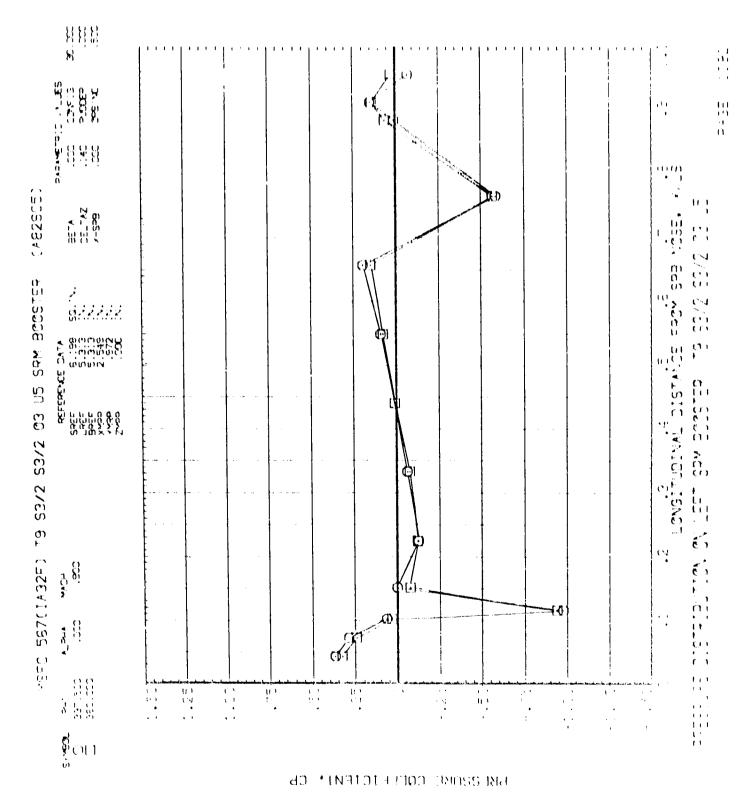


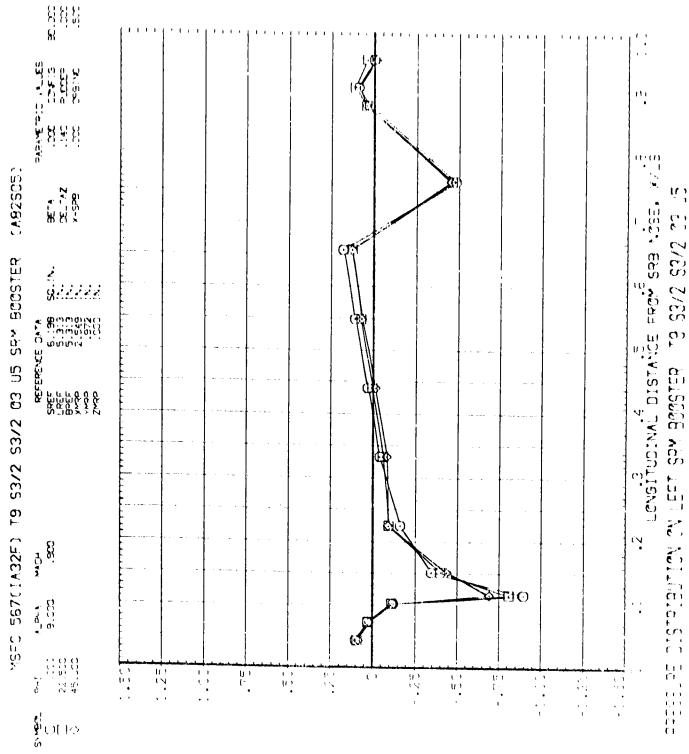


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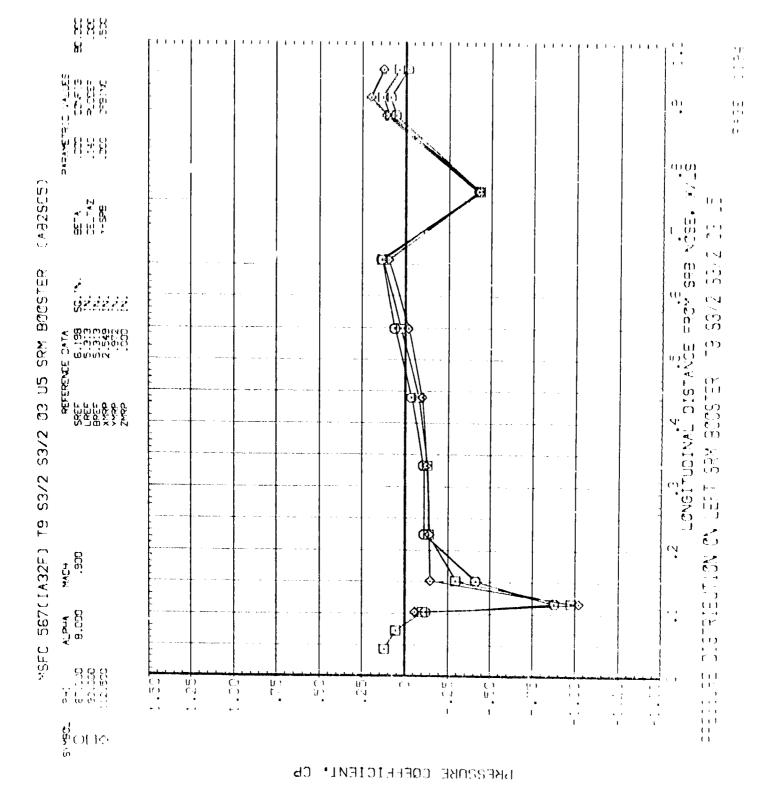






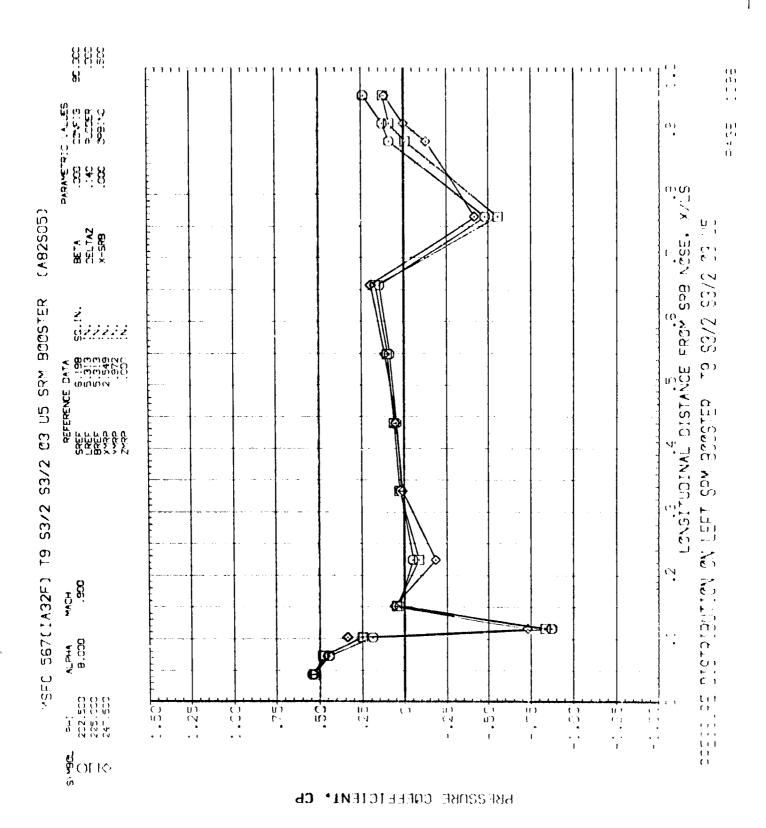


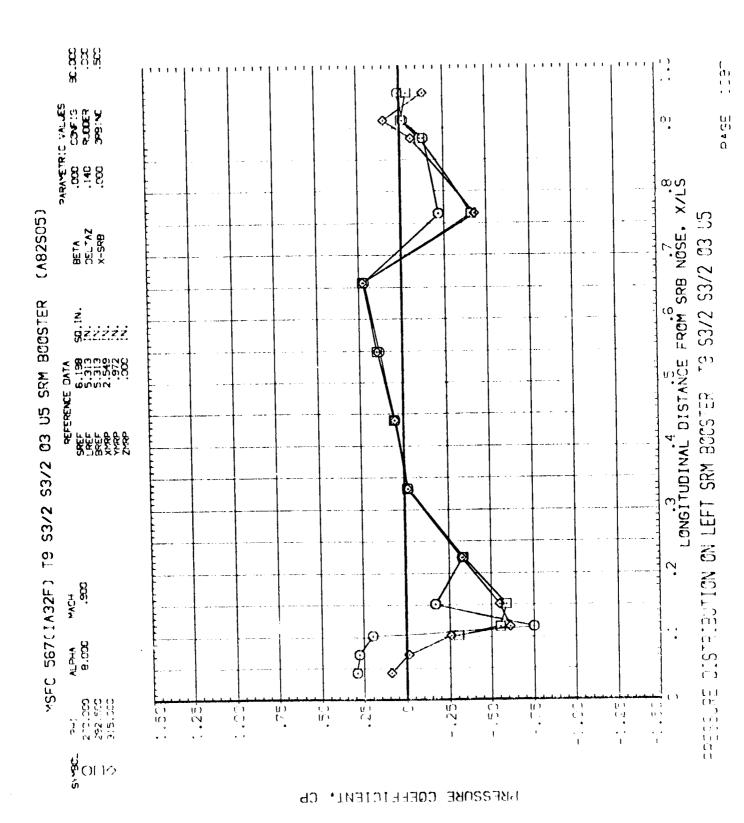
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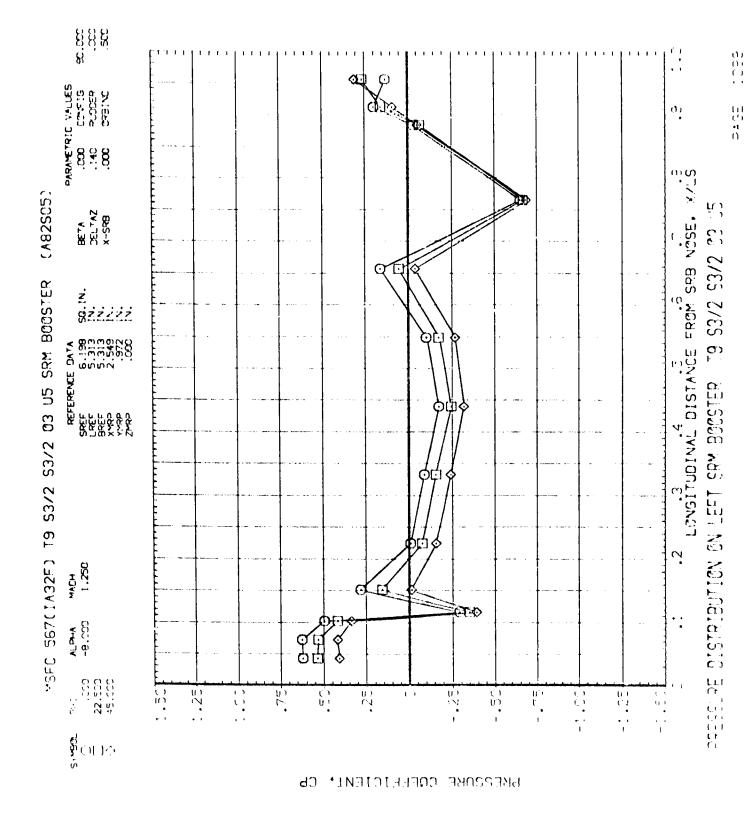


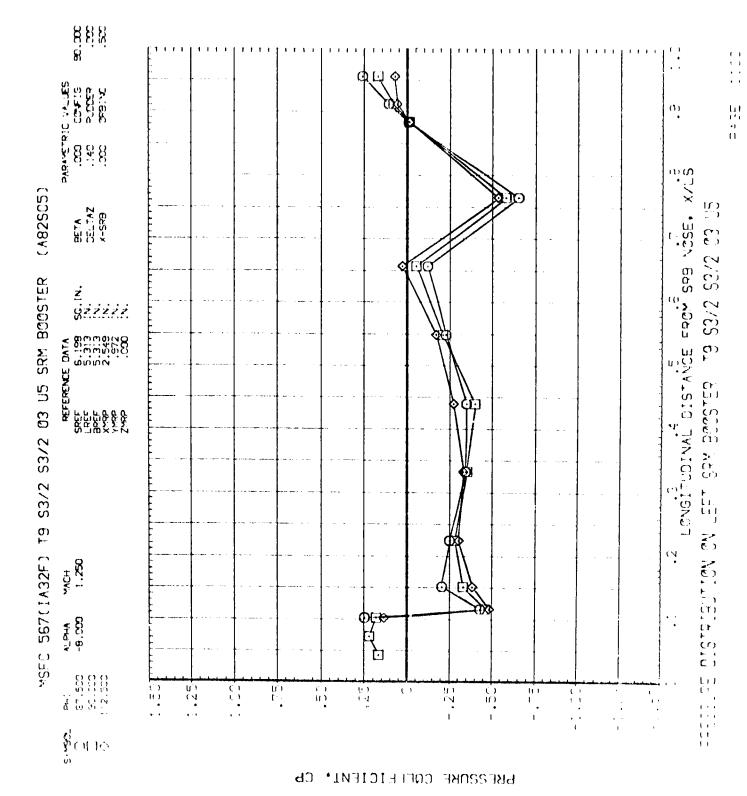


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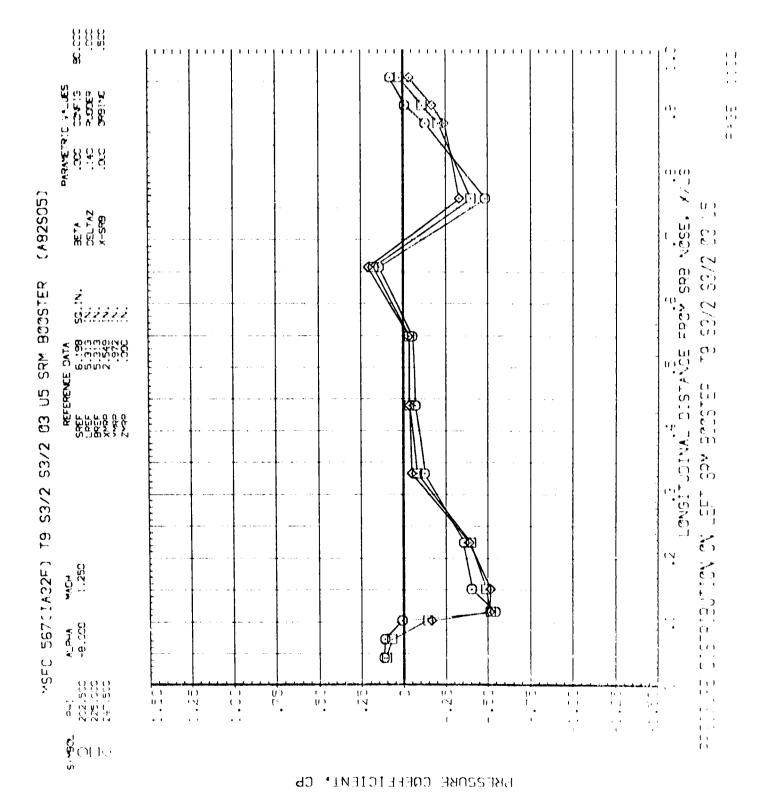
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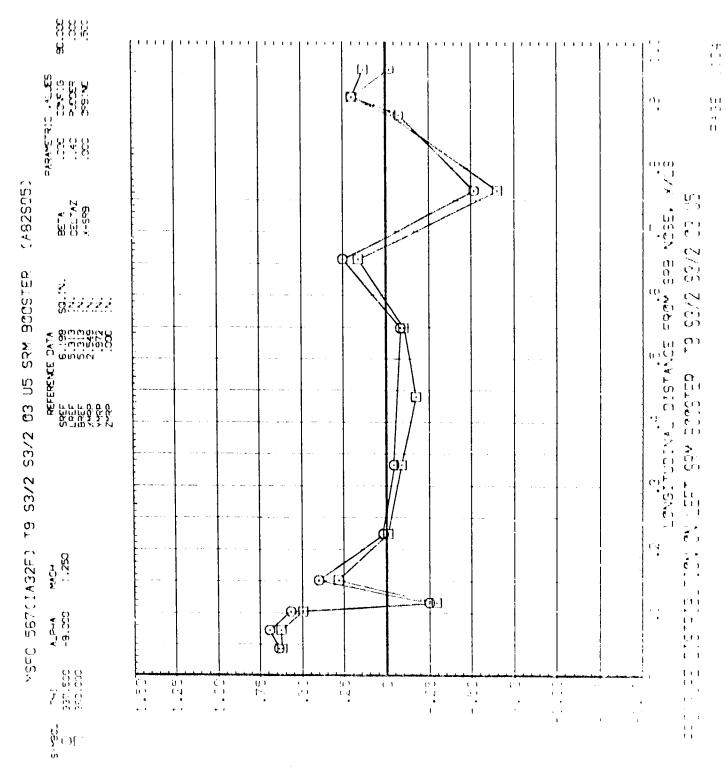
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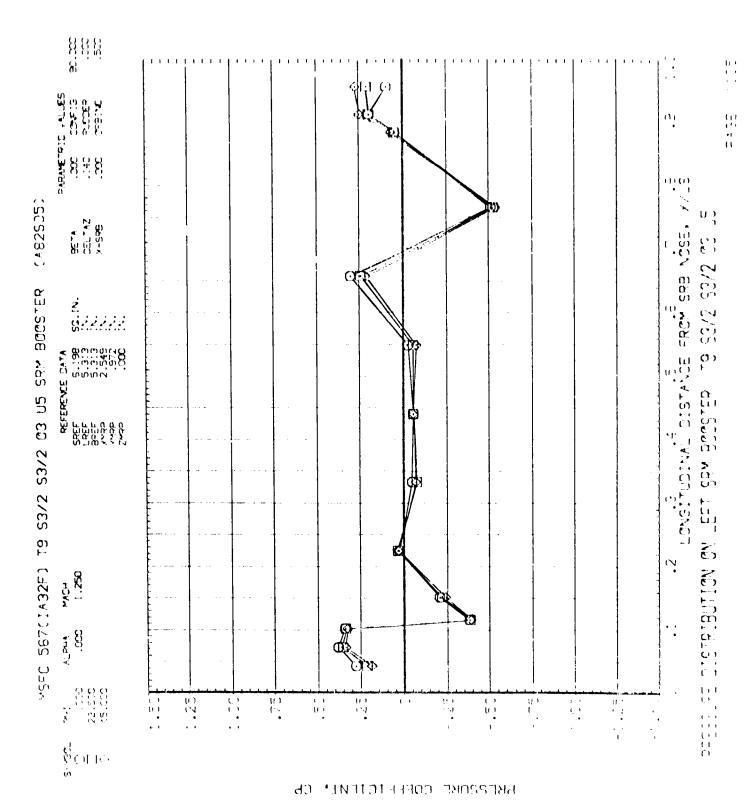
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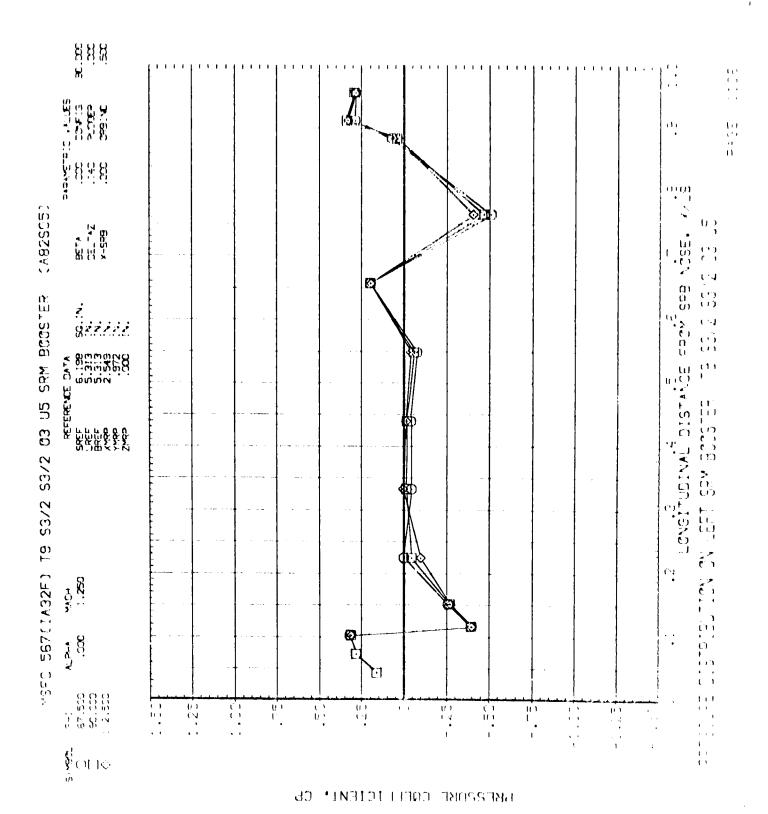
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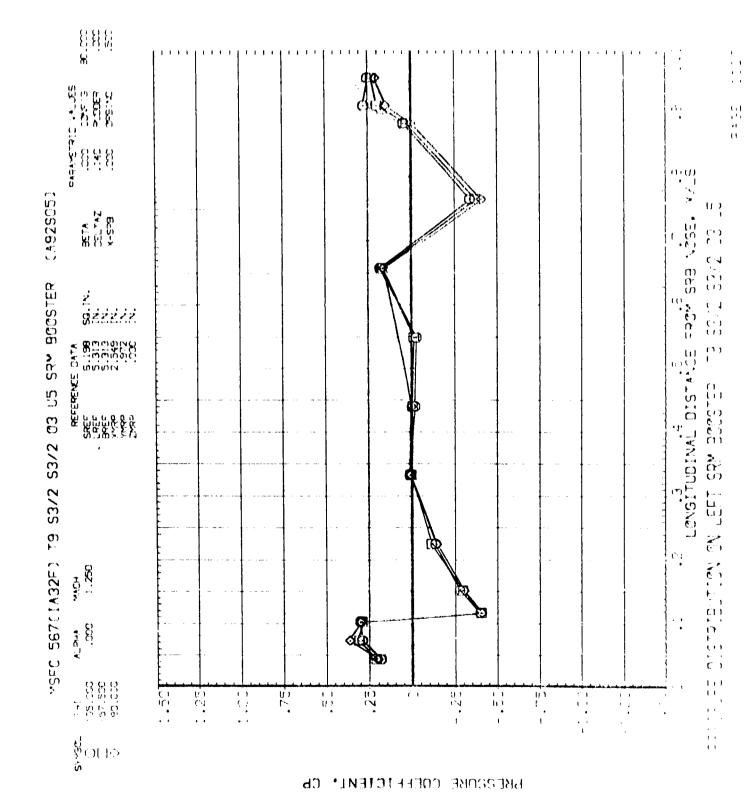
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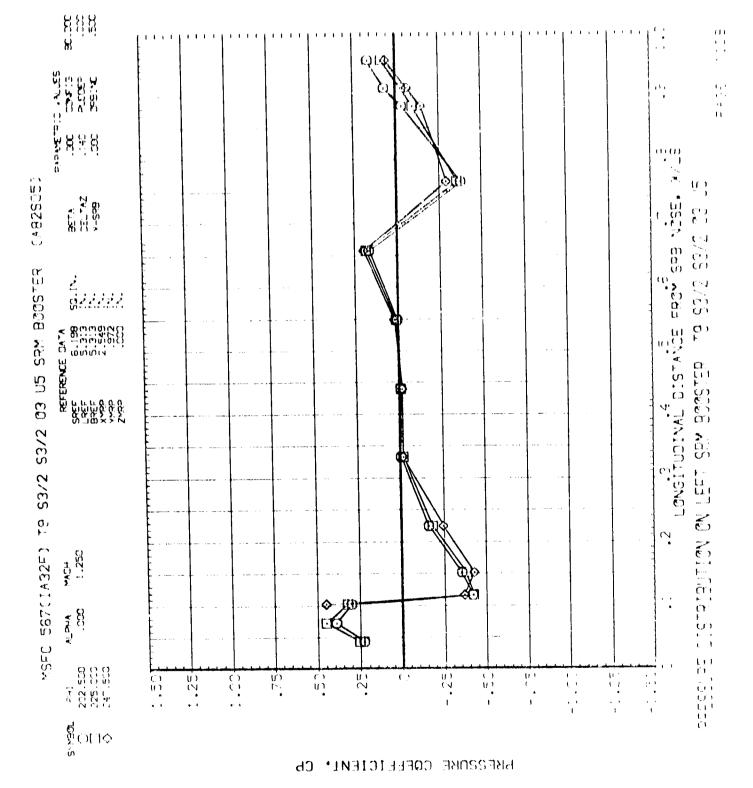


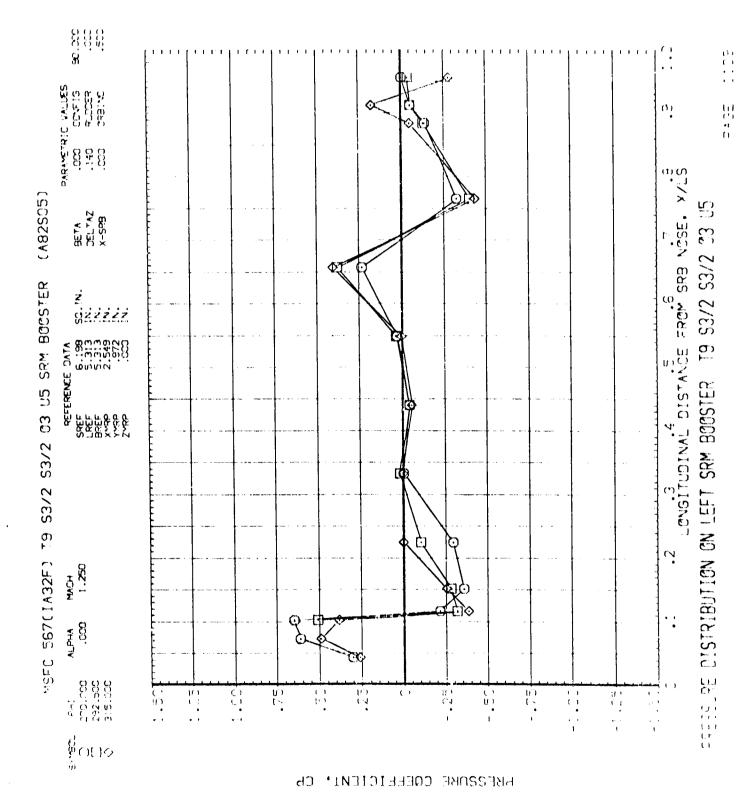
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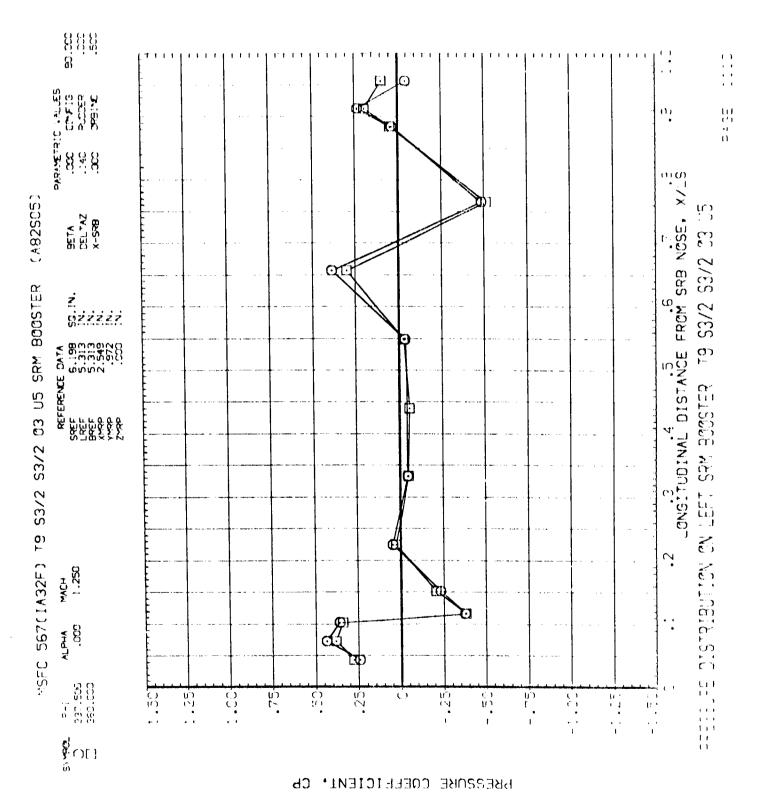


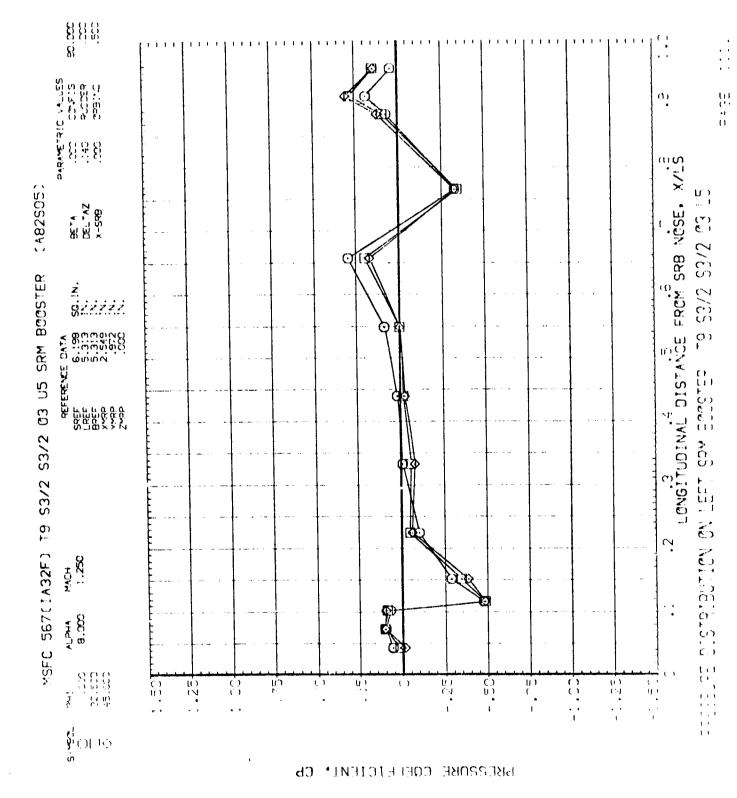


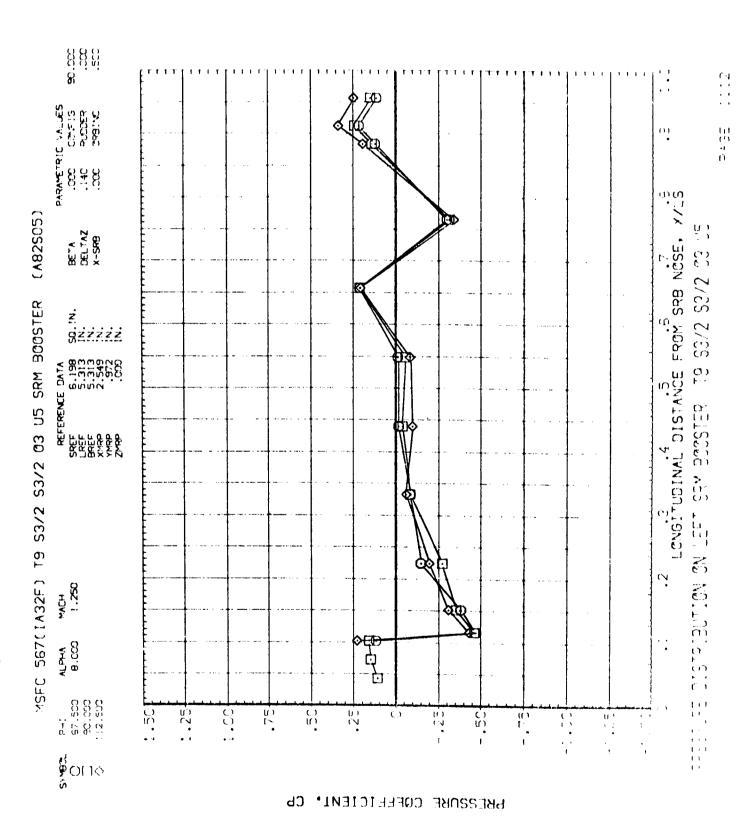


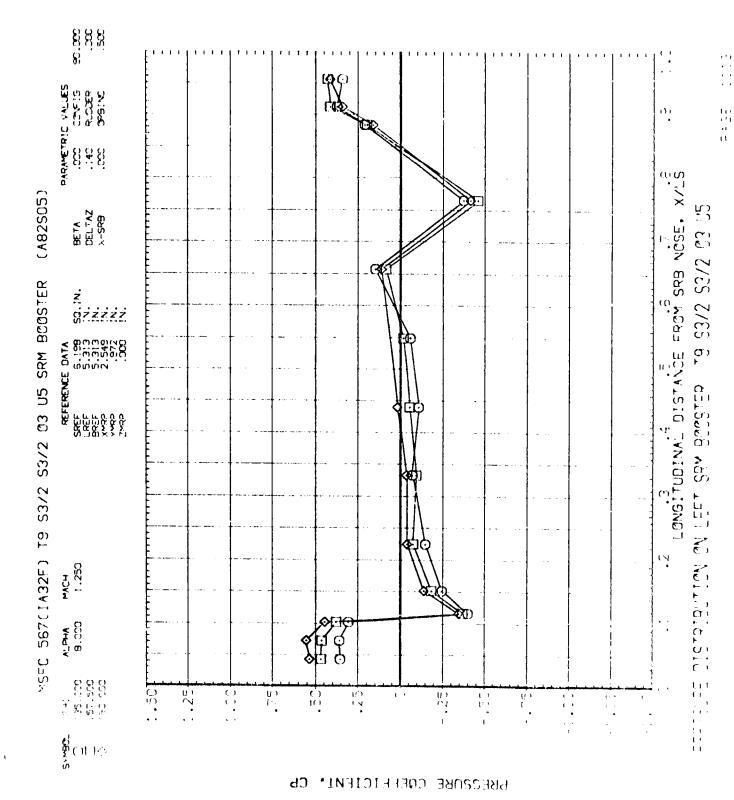


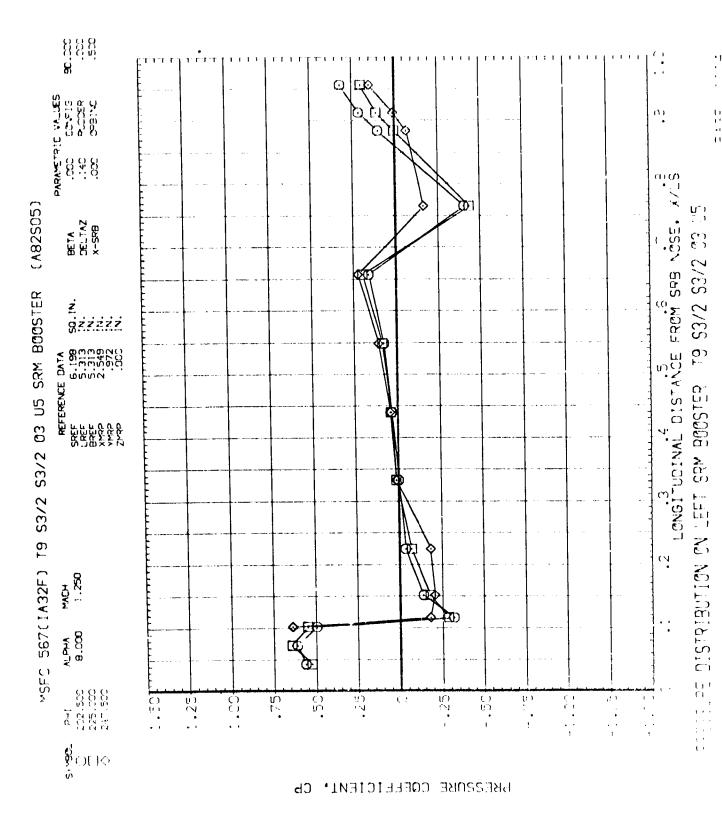


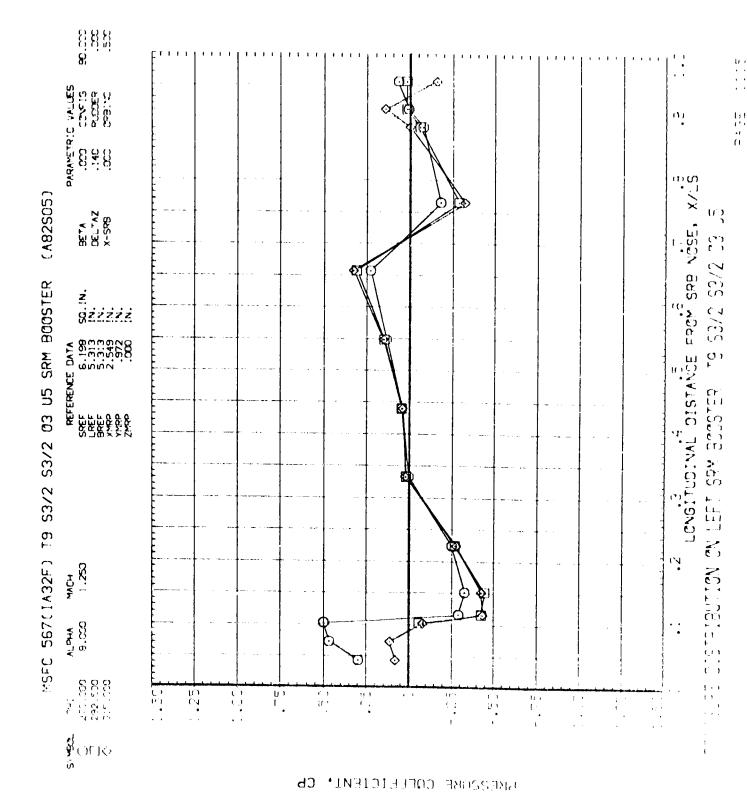


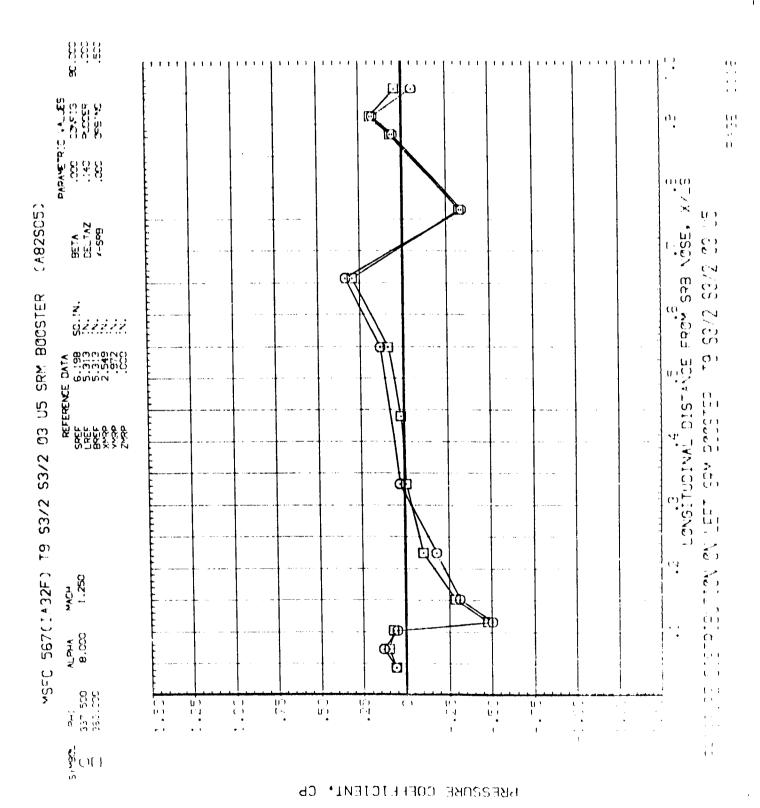


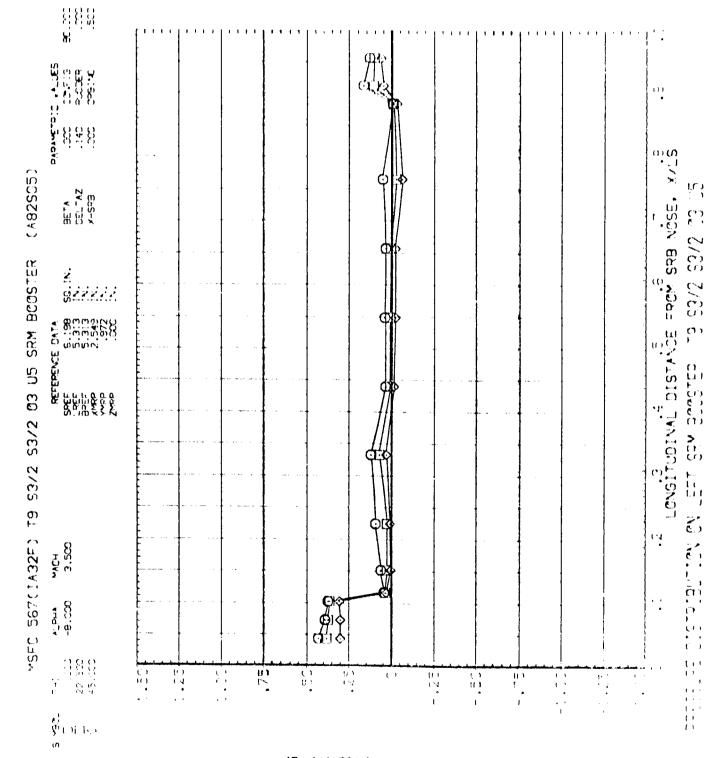






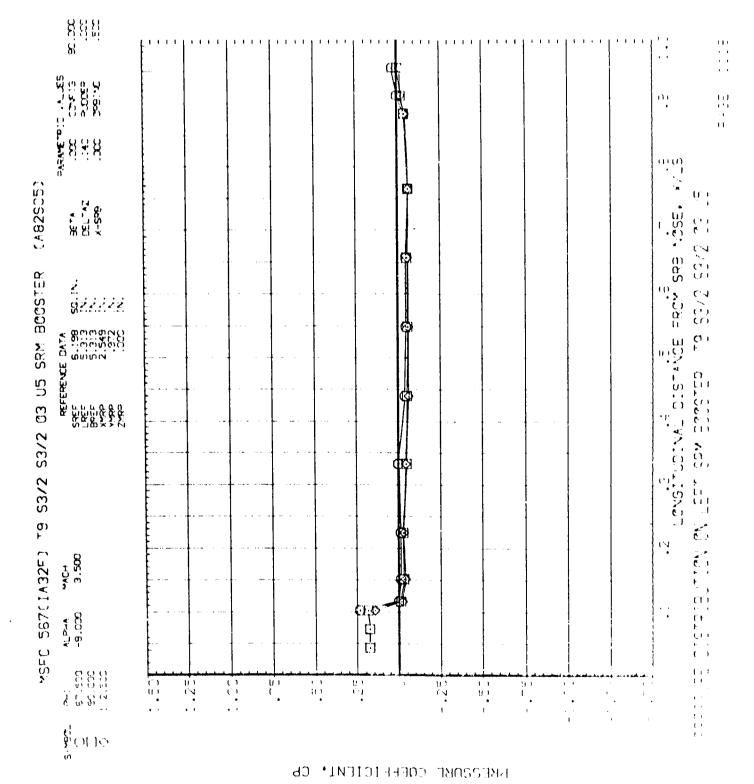






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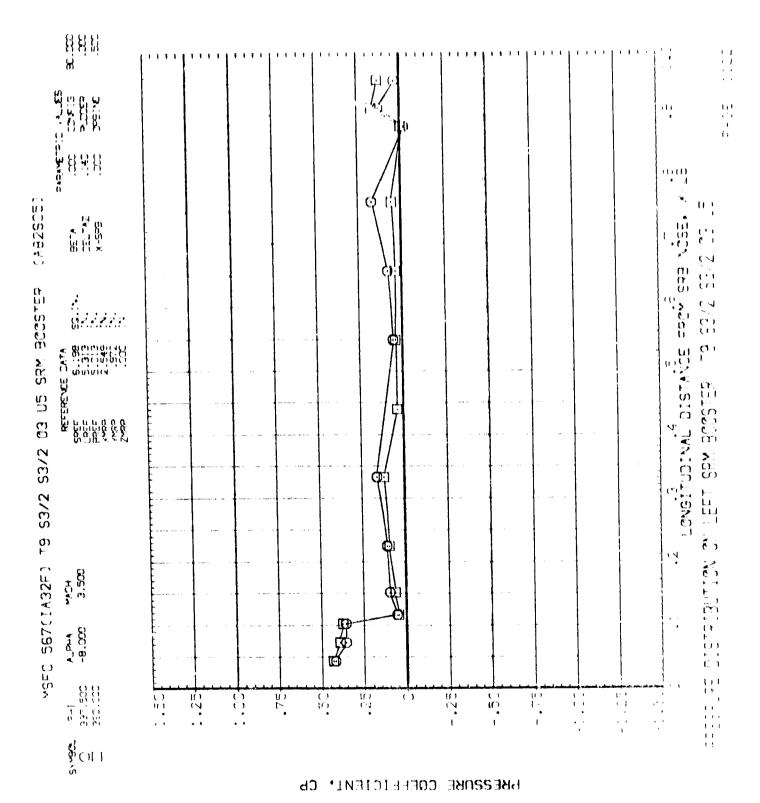
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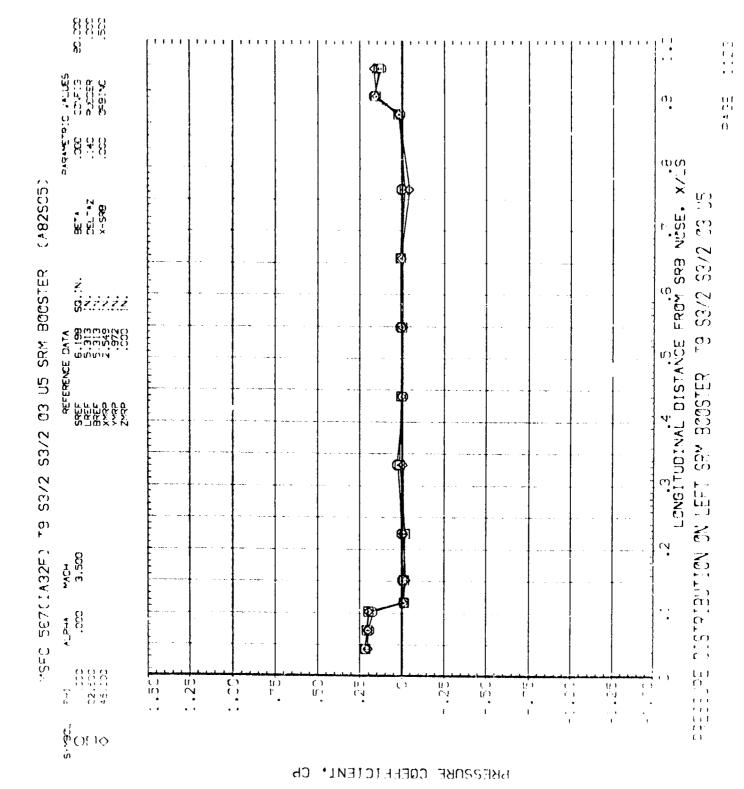
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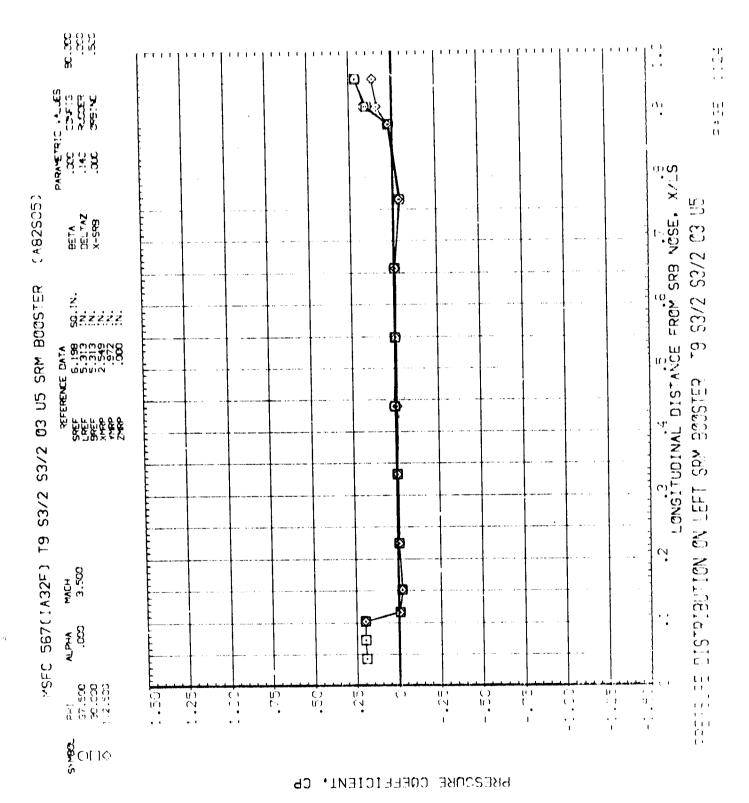
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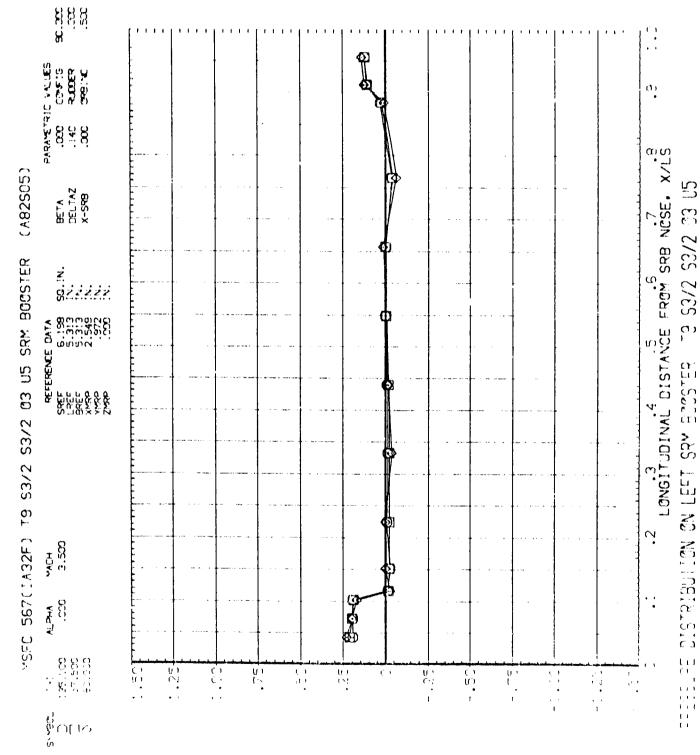
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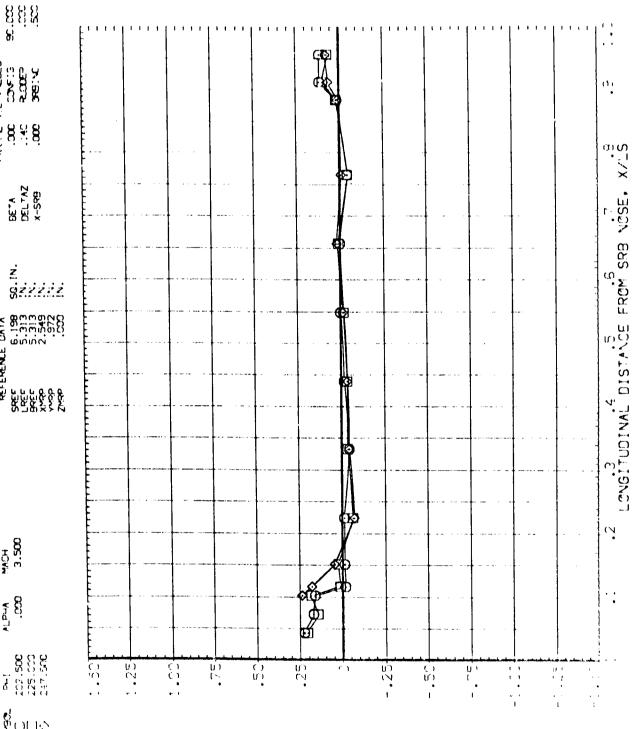








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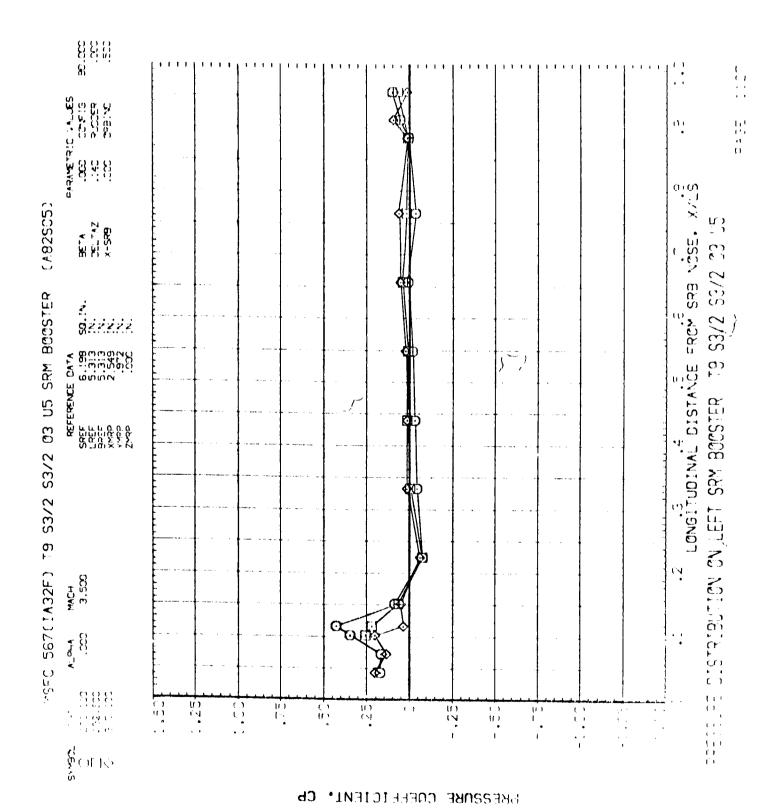


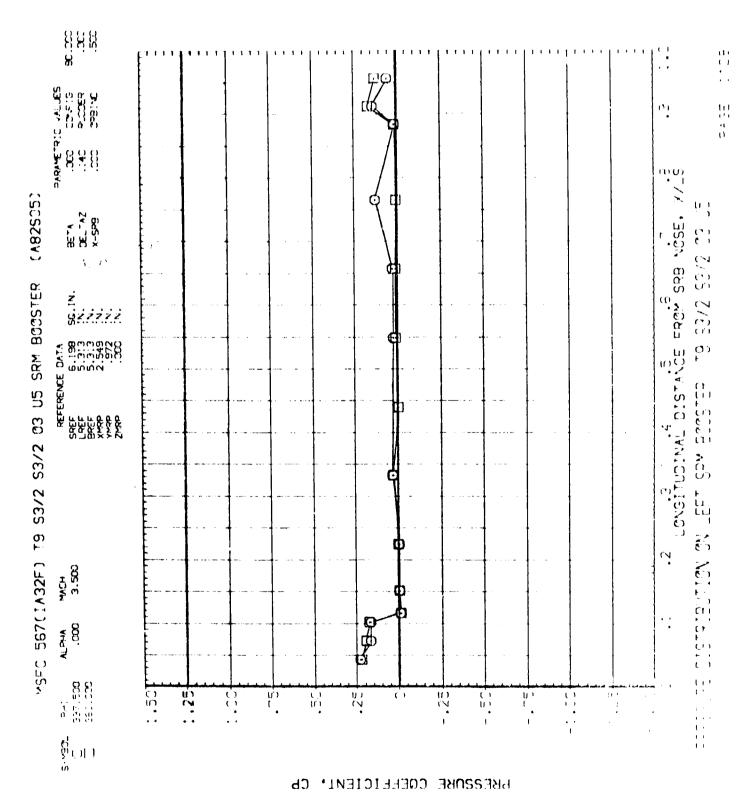
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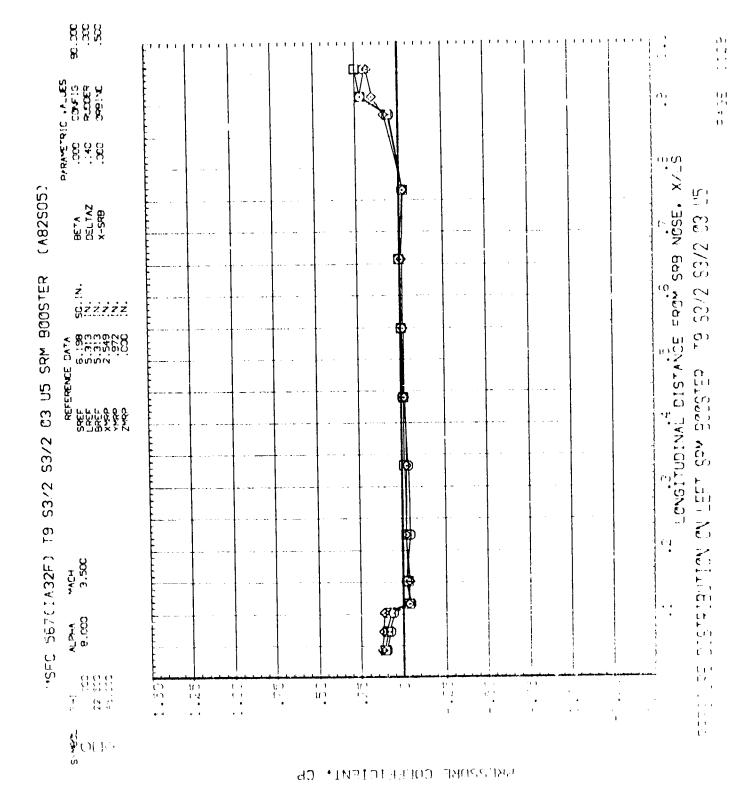
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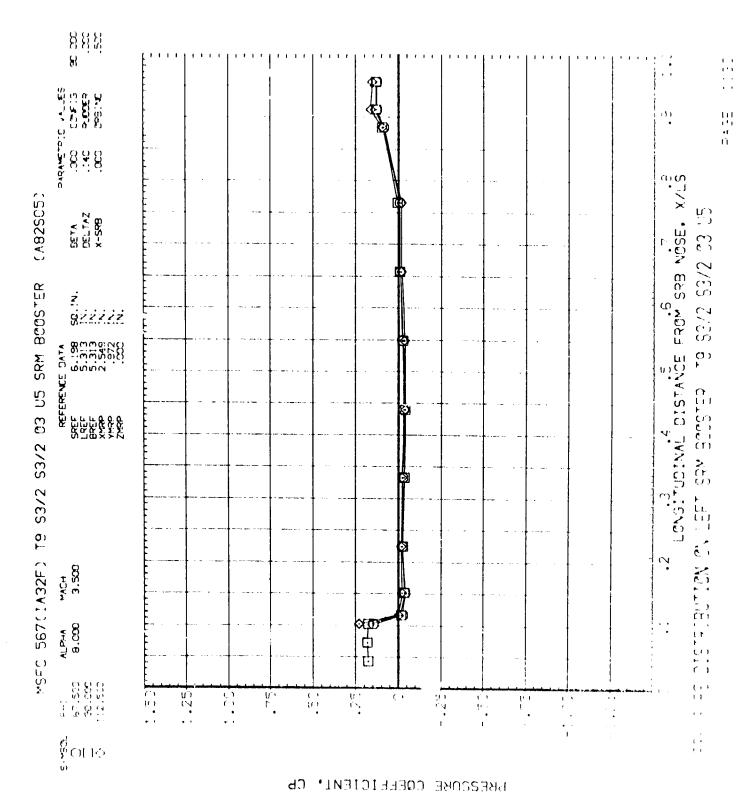
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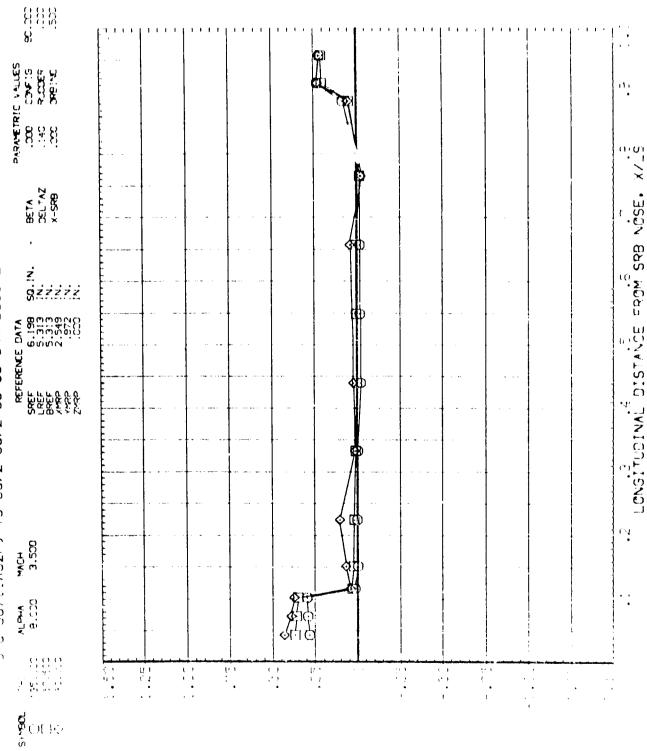
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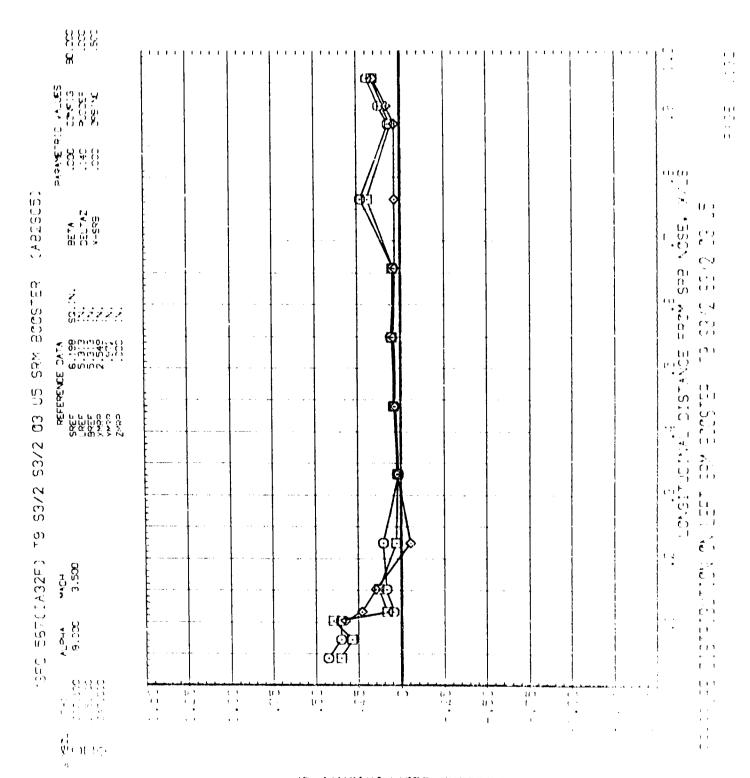




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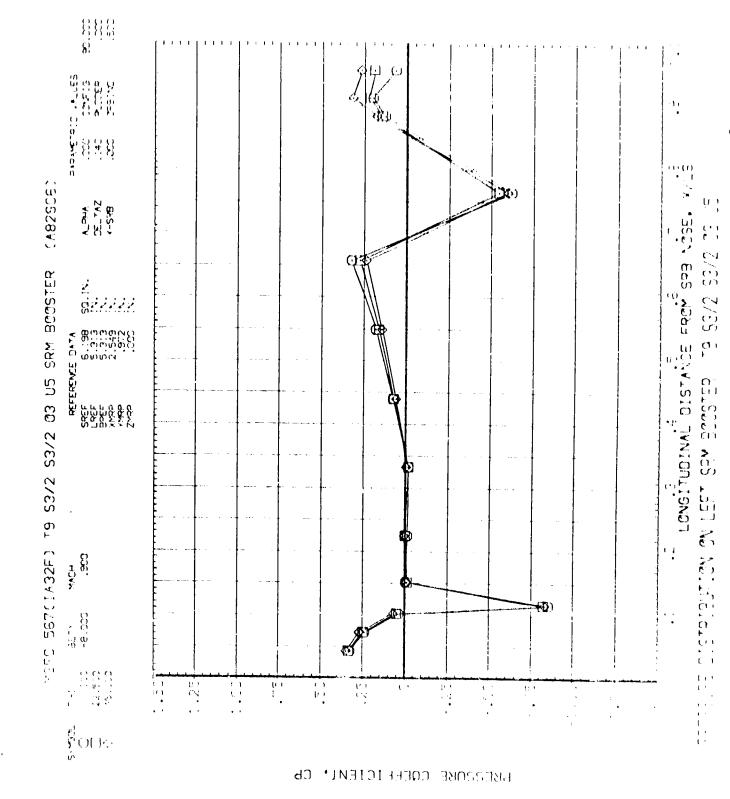
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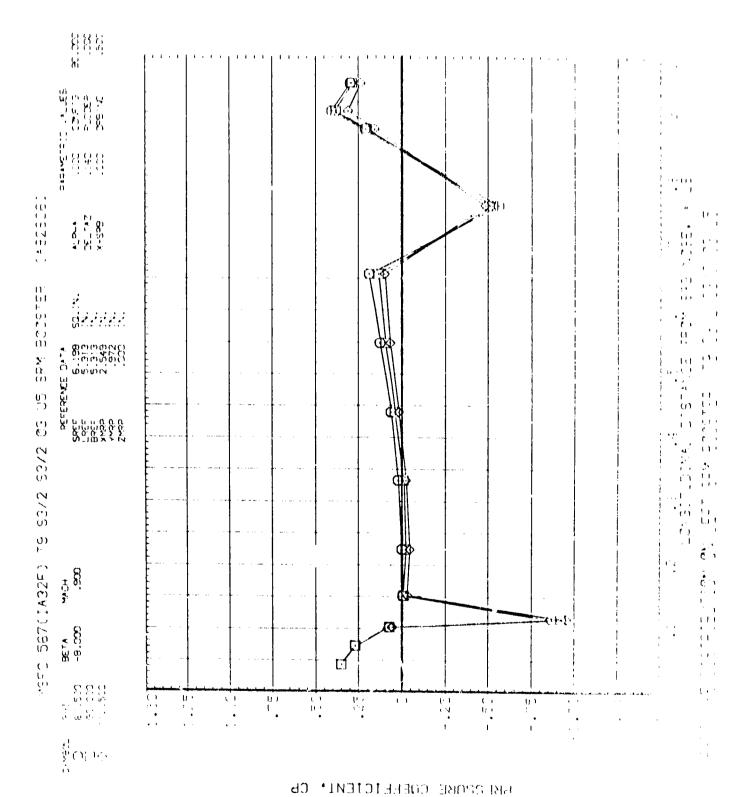
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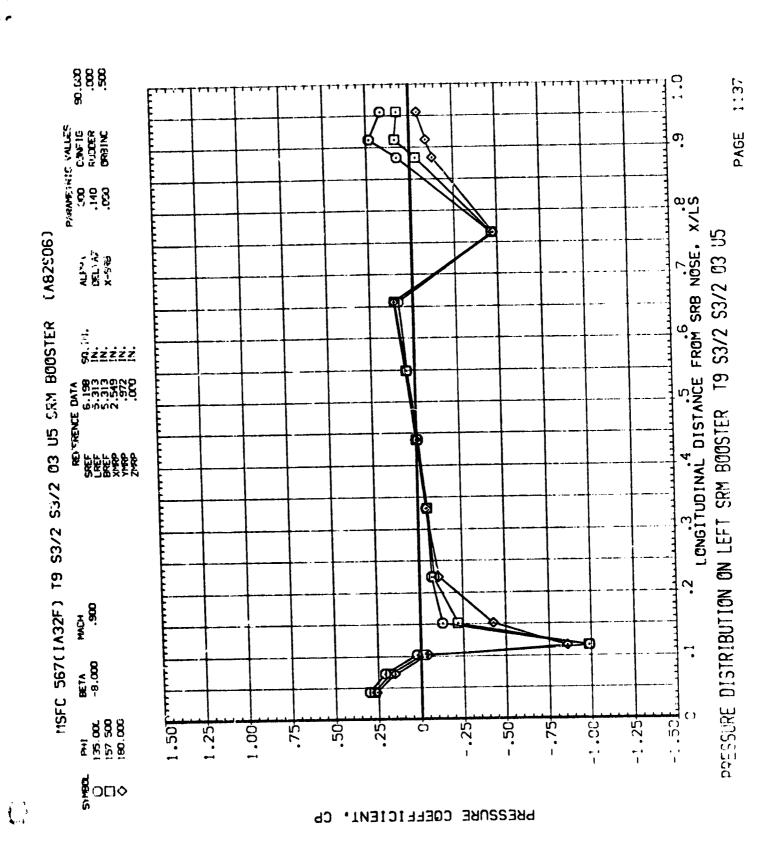
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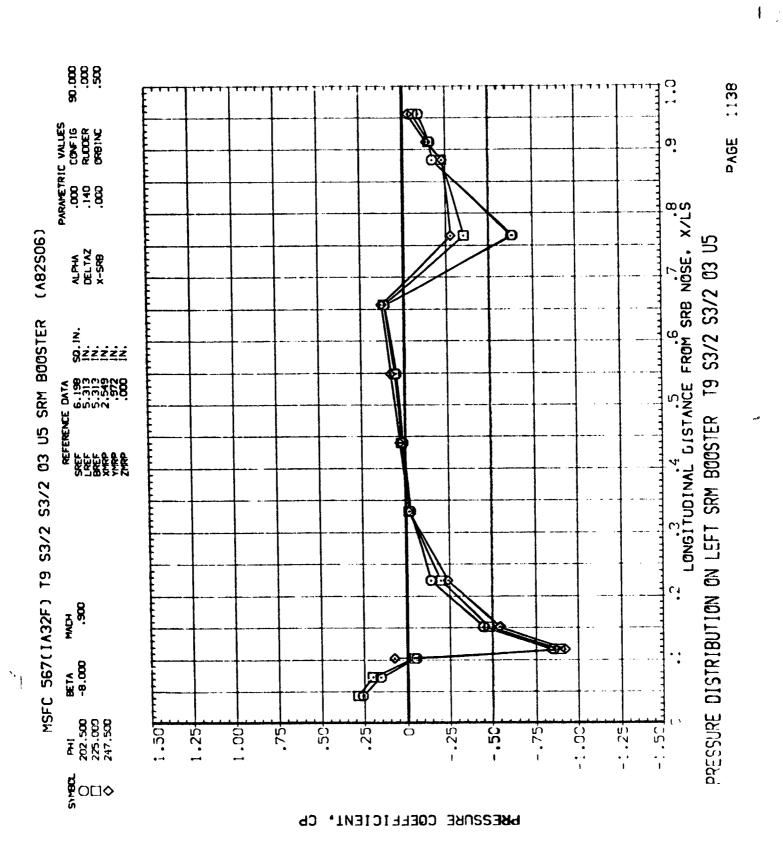
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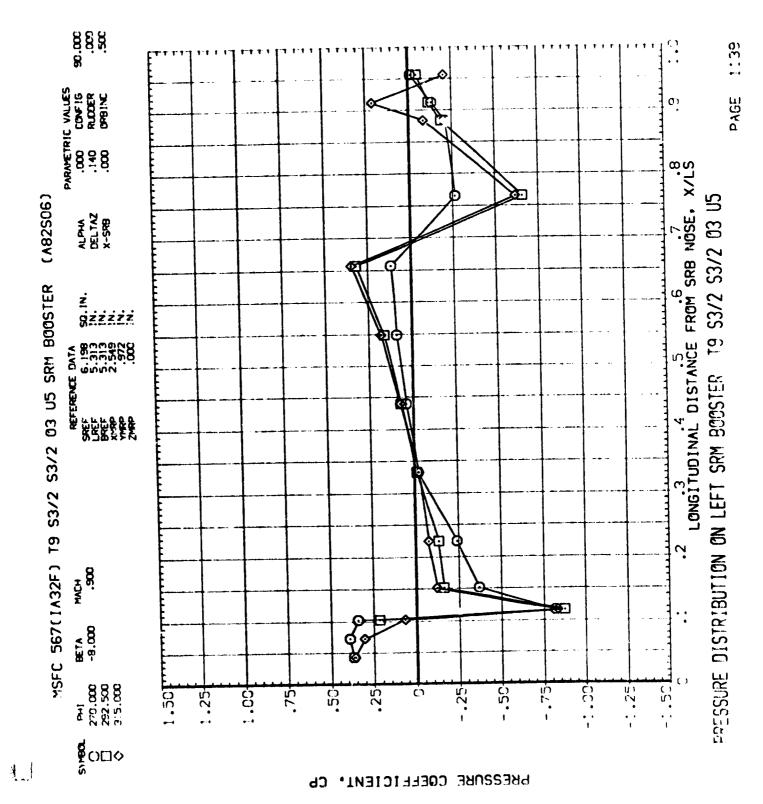


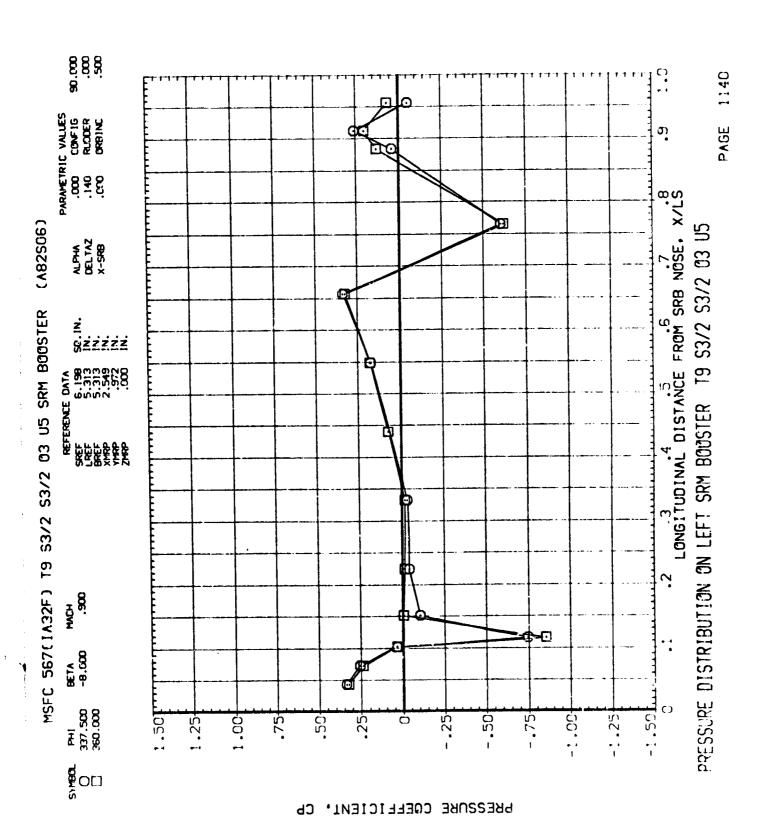


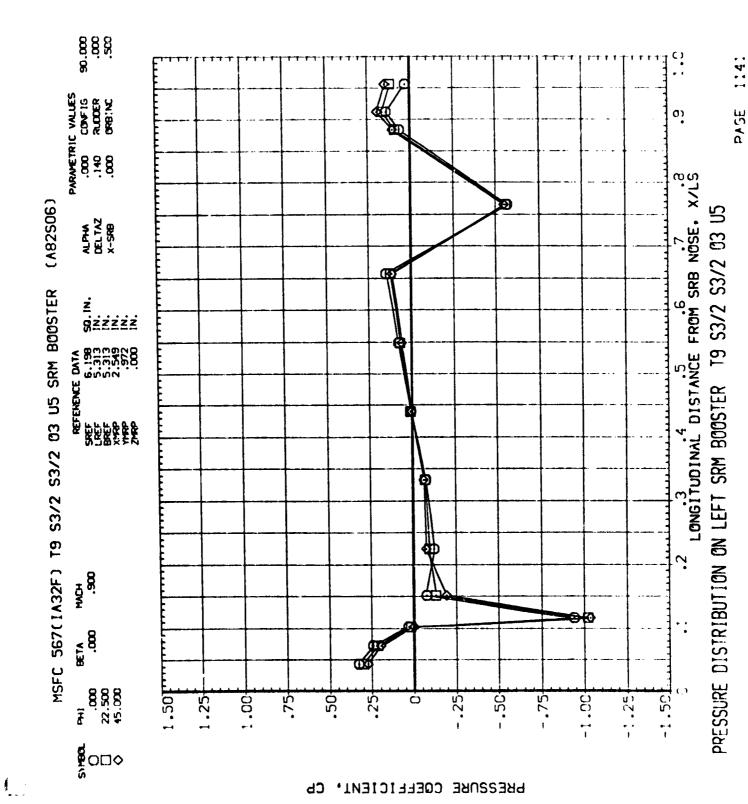


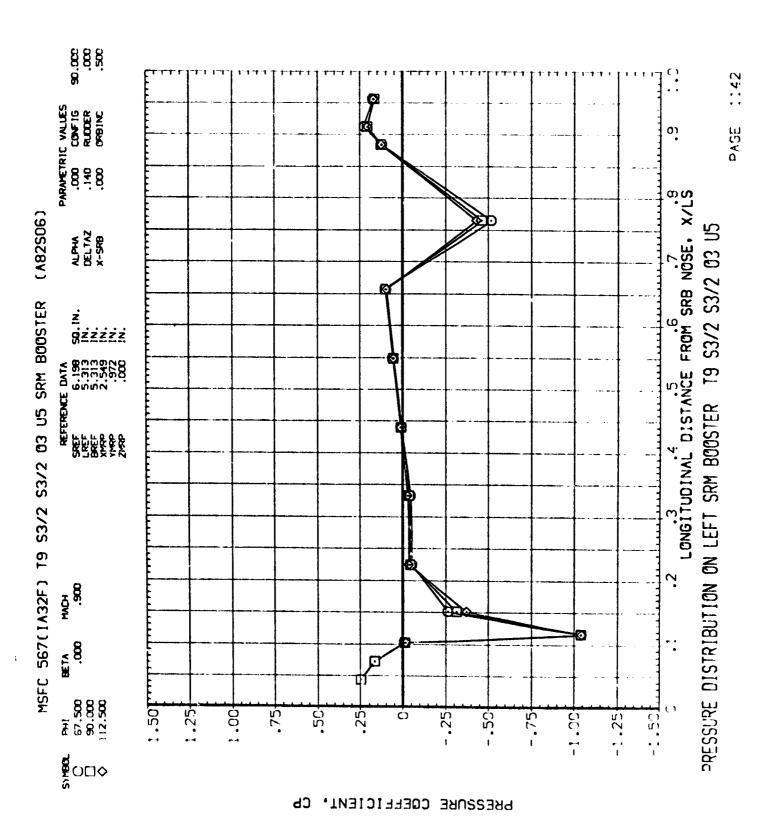
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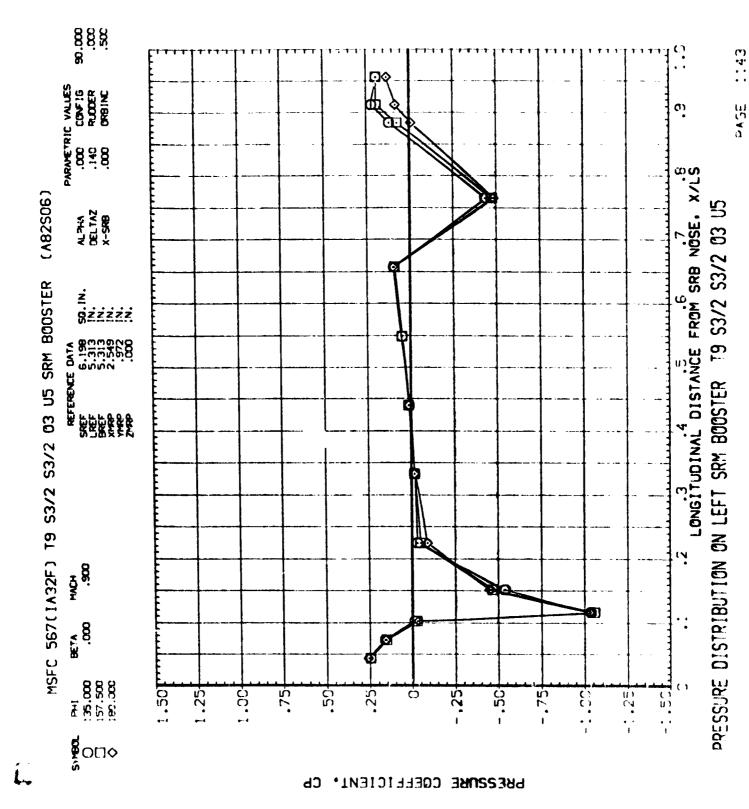




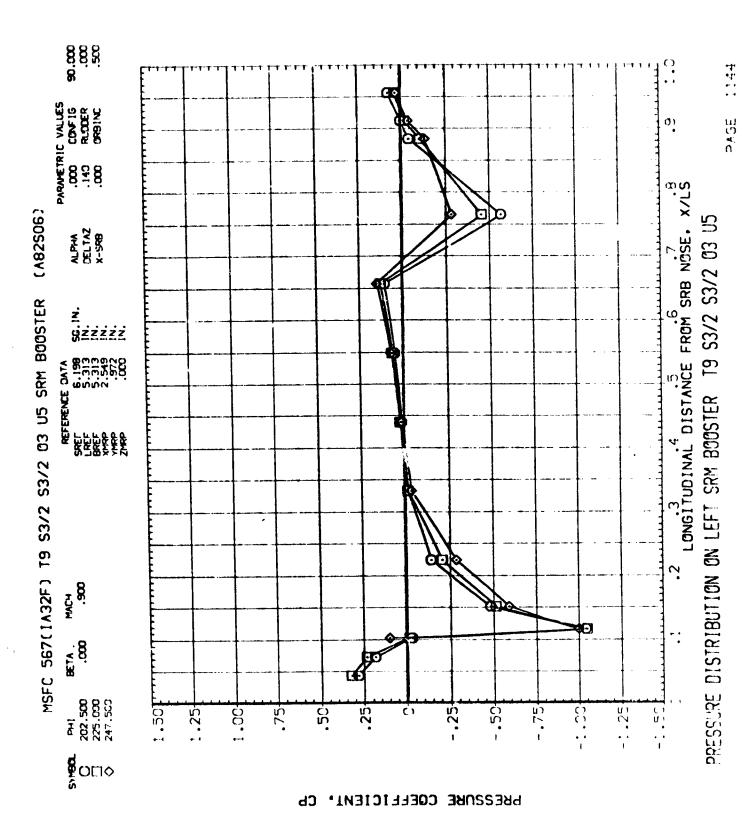


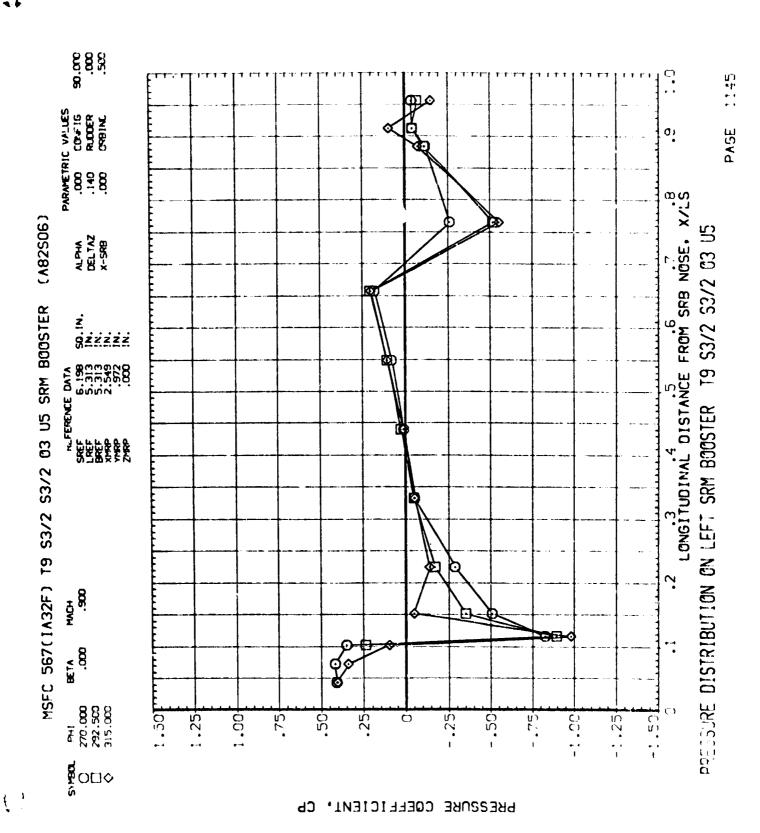


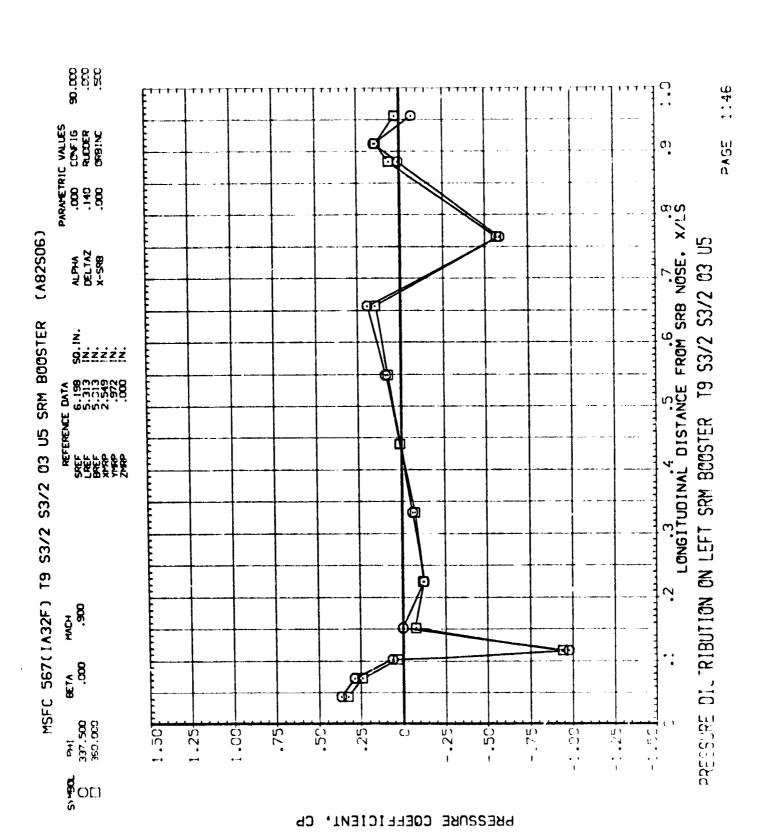


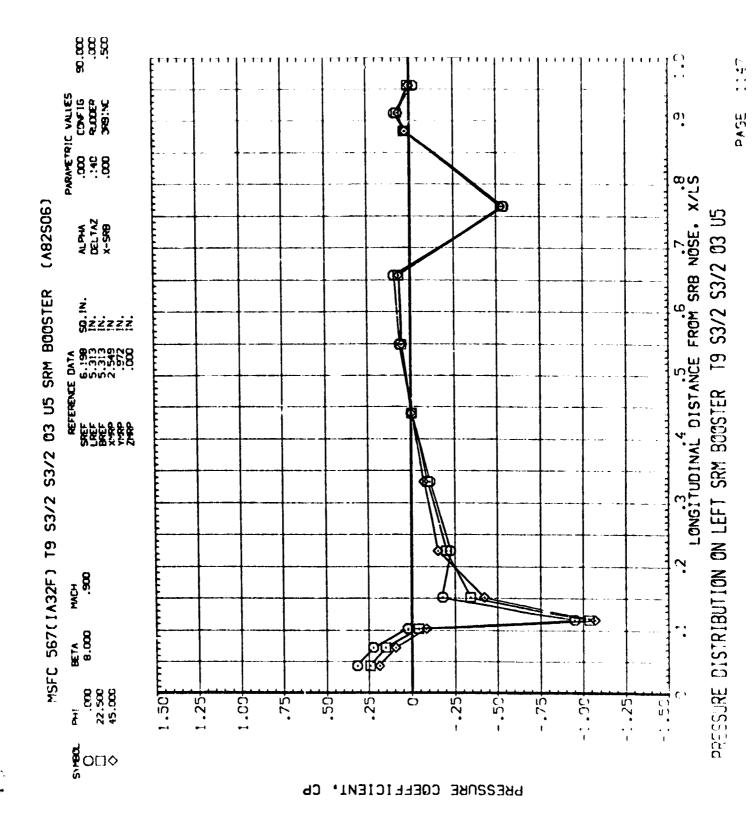


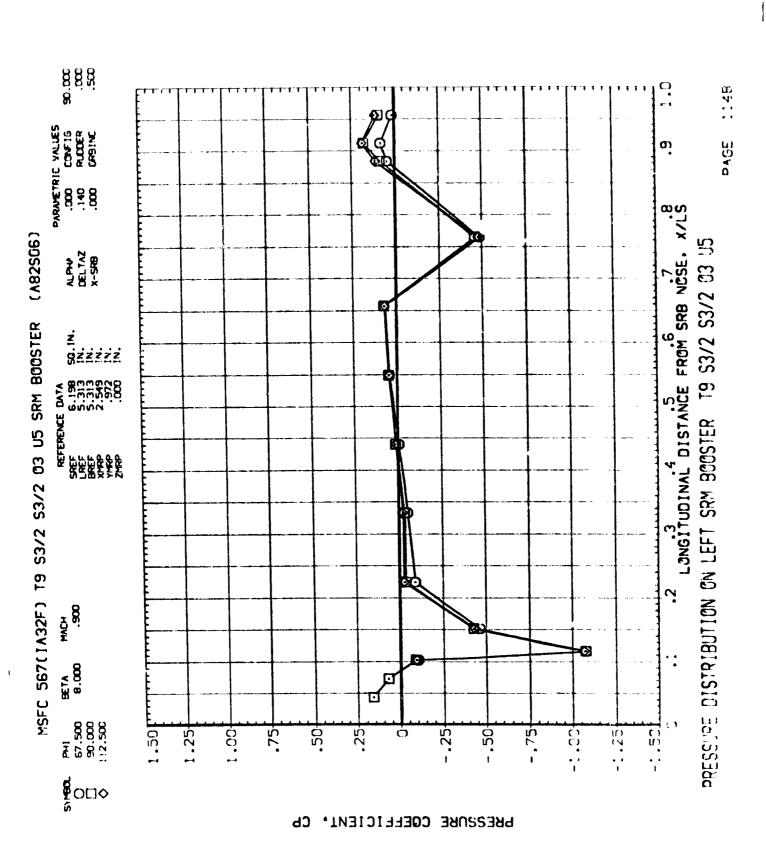
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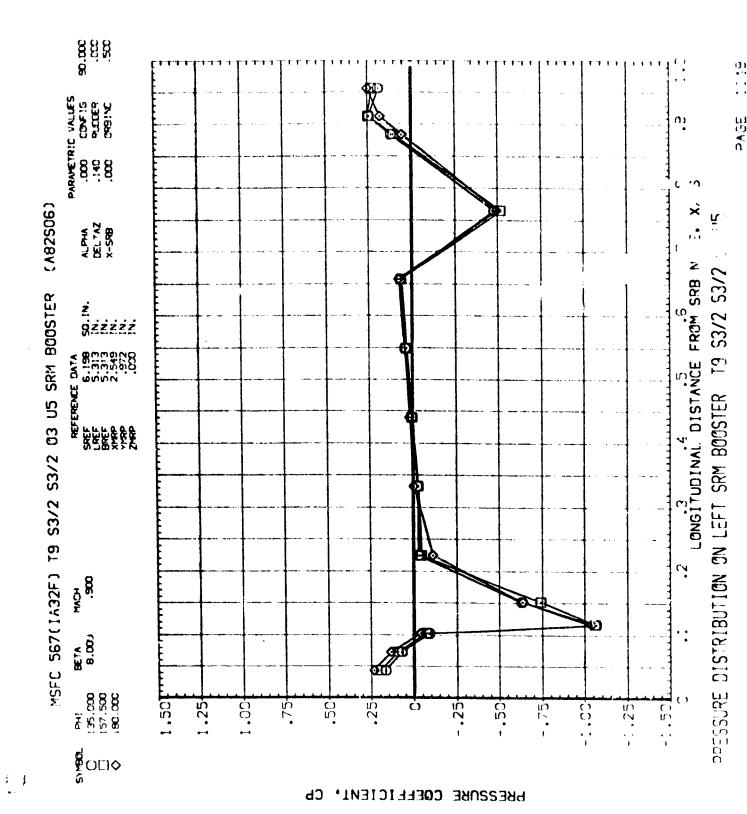


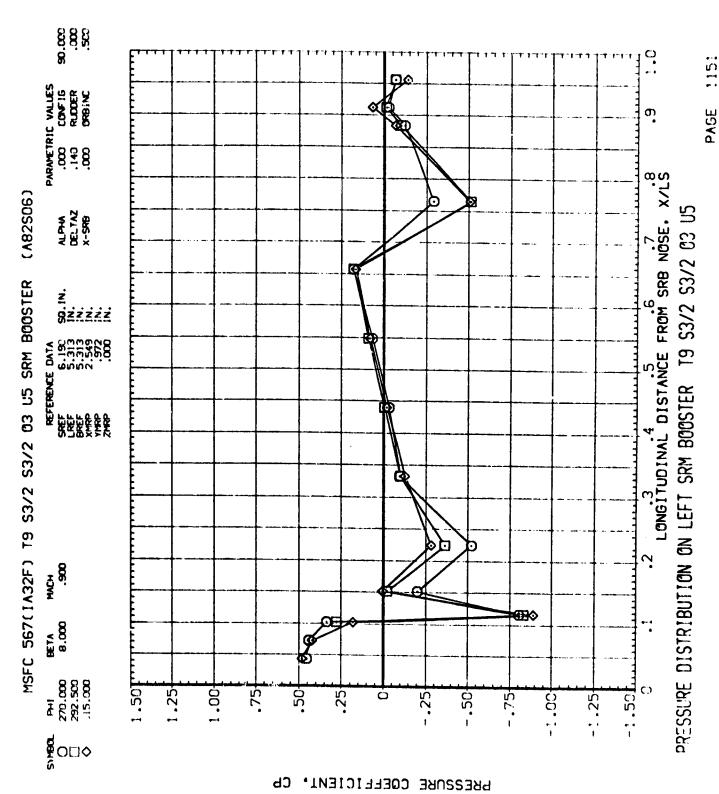




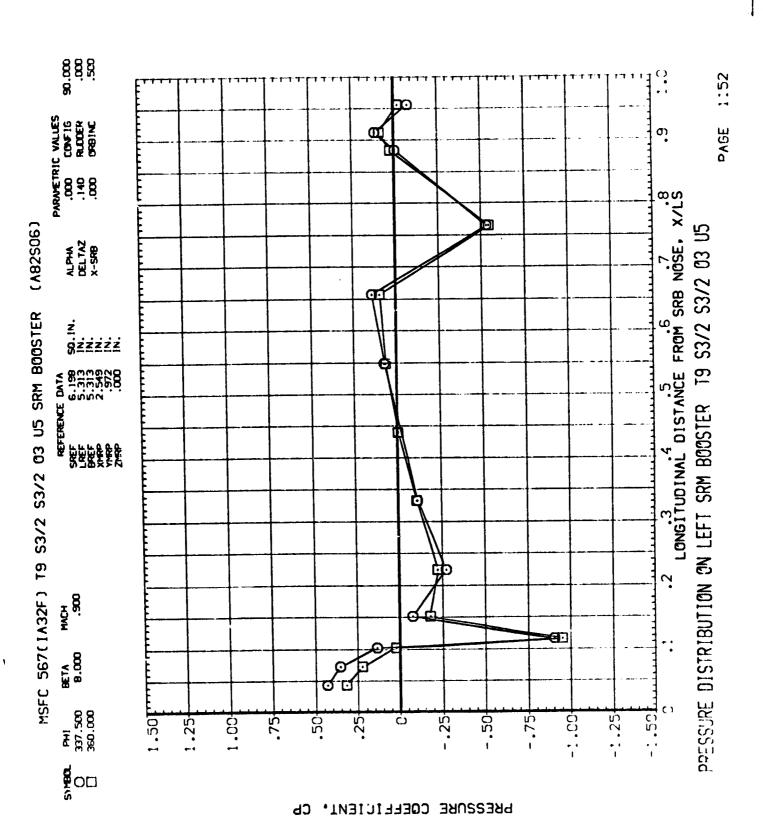


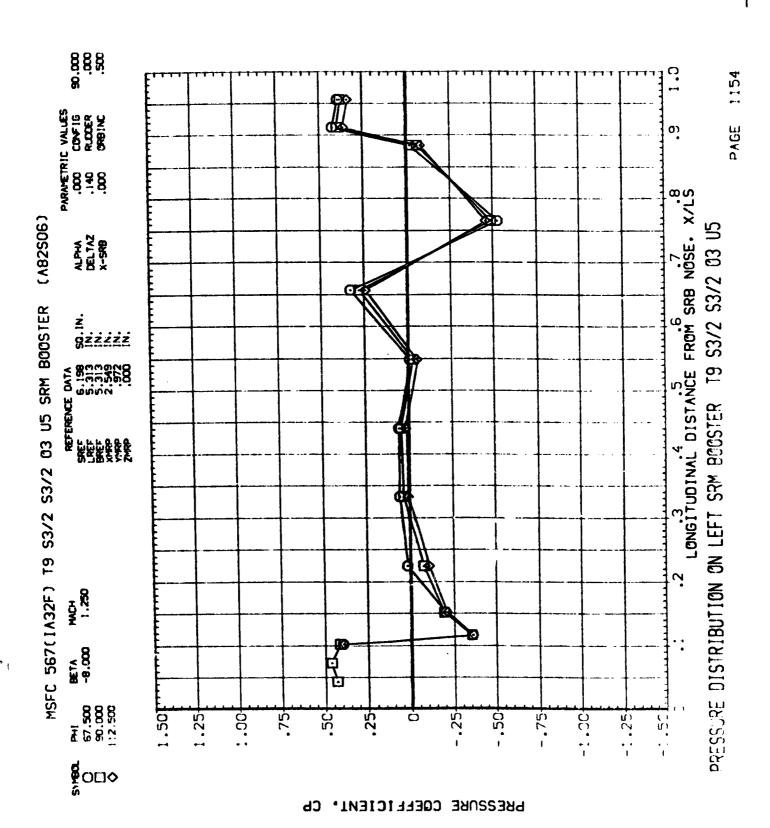


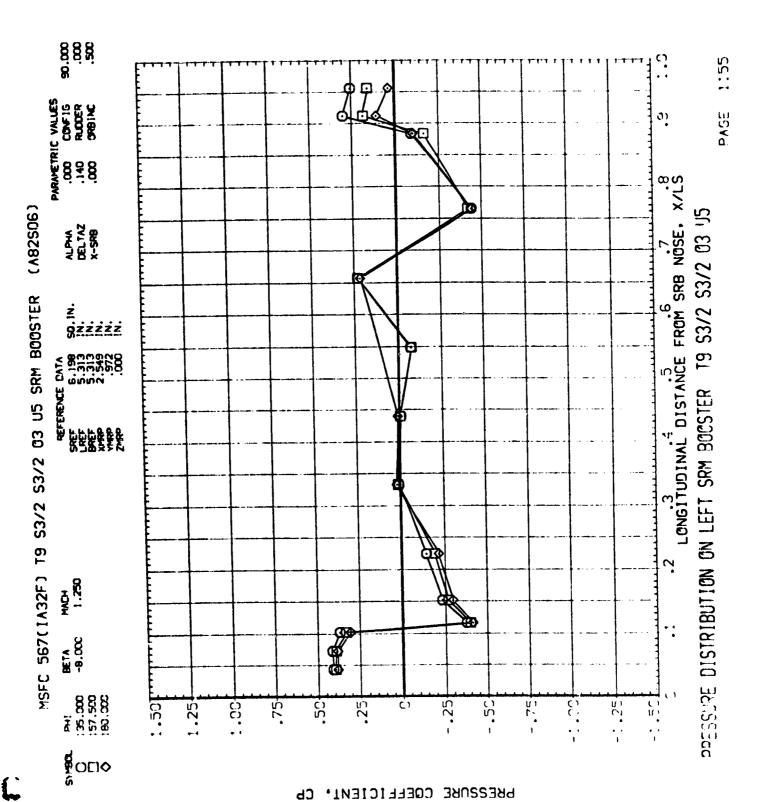


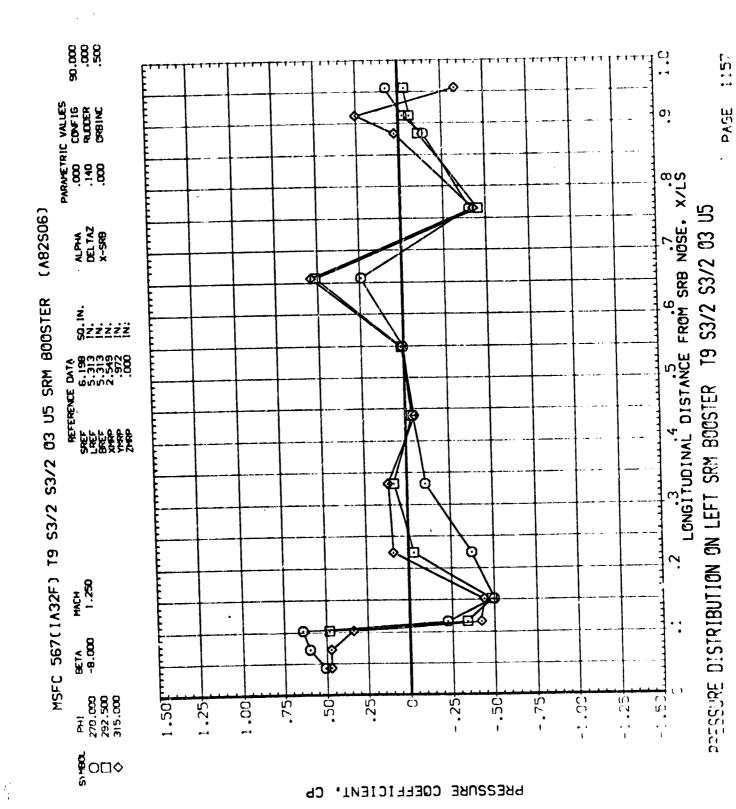


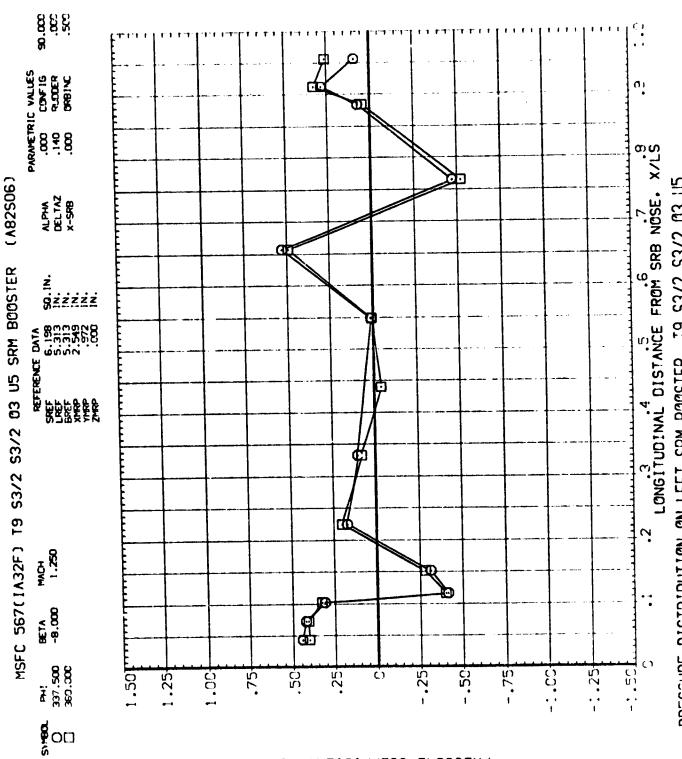
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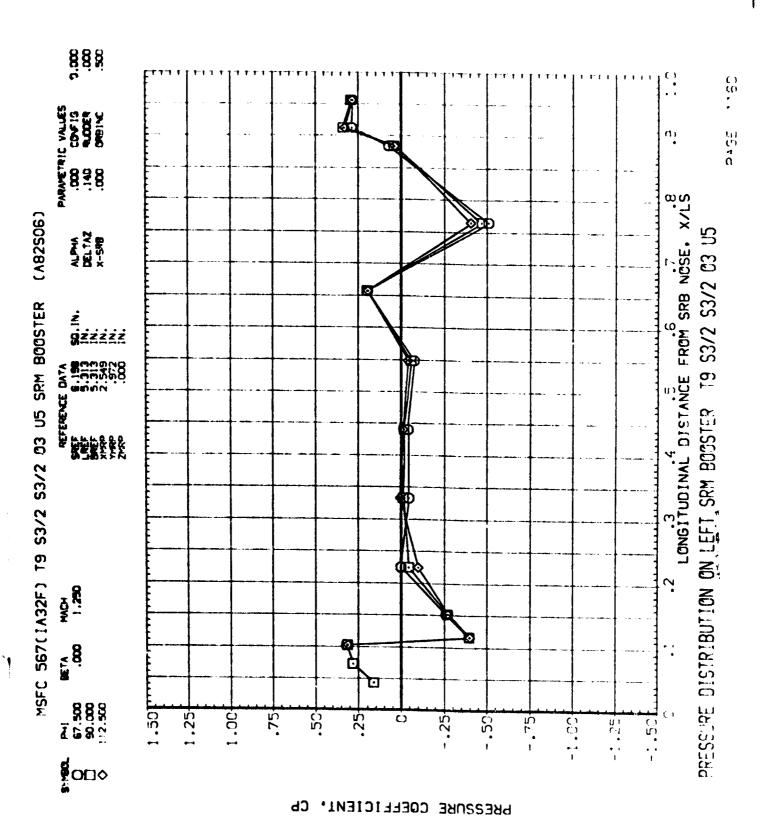
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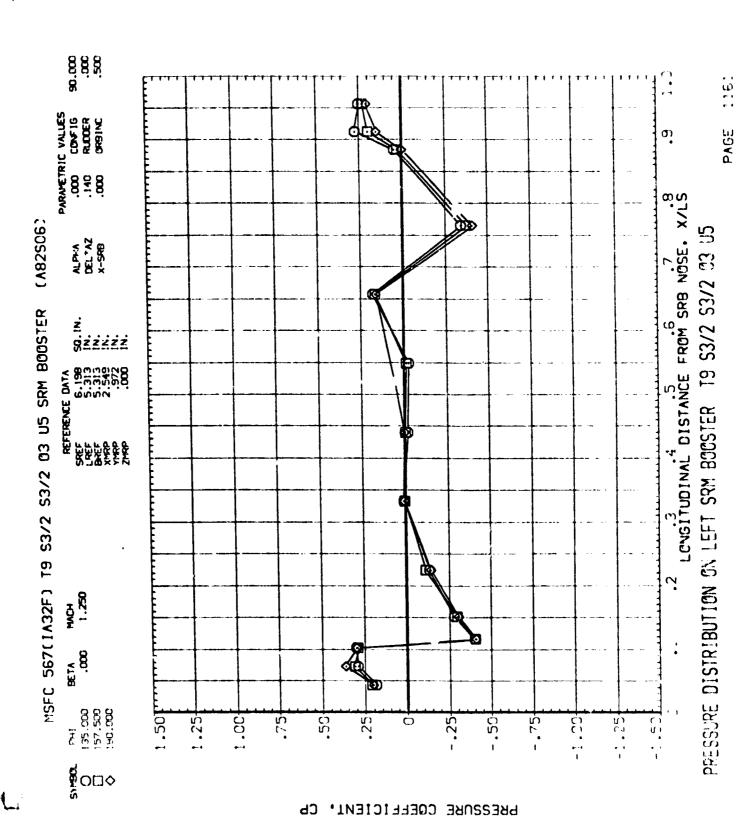
19 S3/2 S3/2 03 U5 PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER

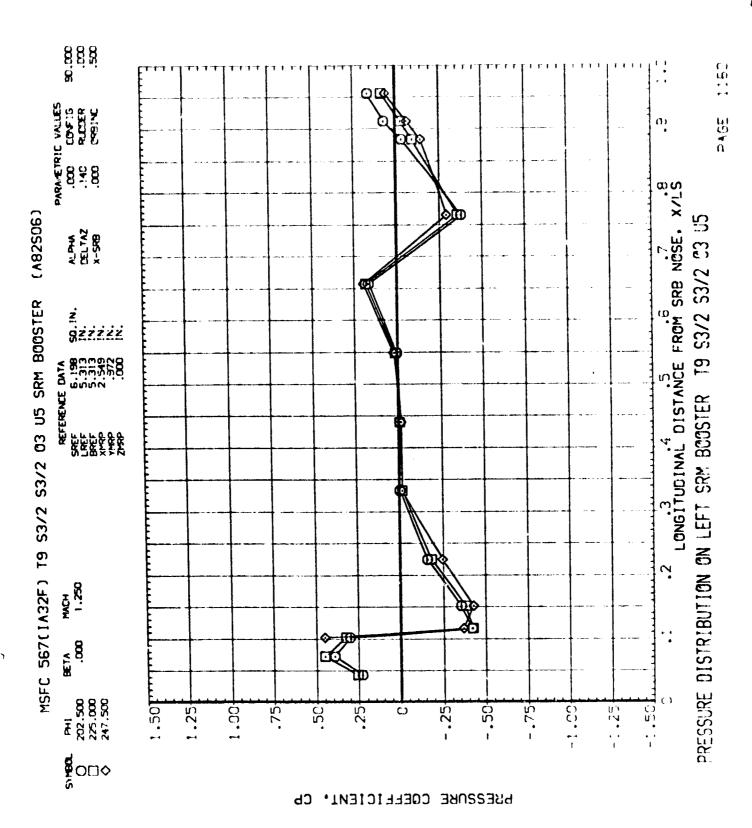
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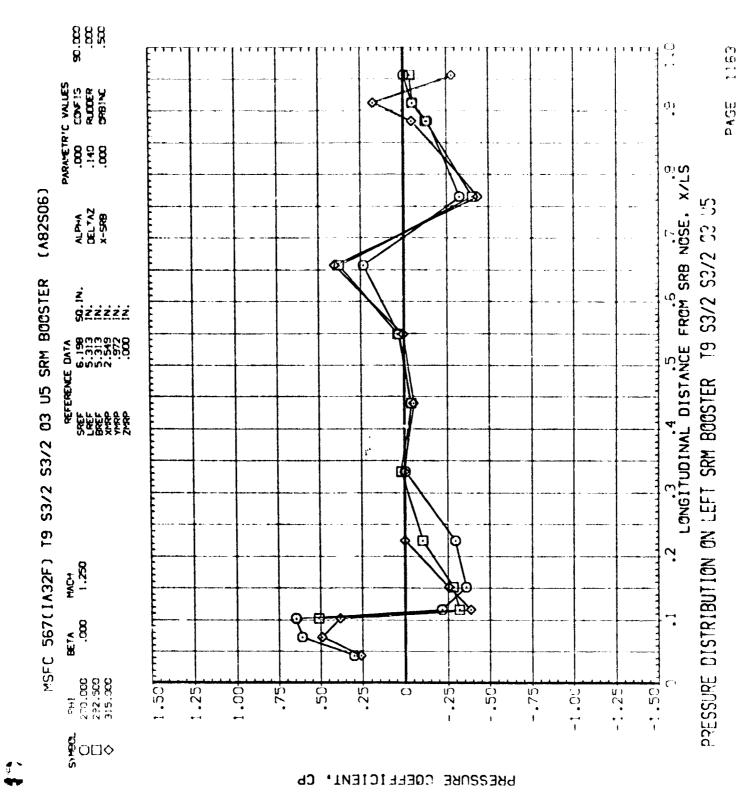
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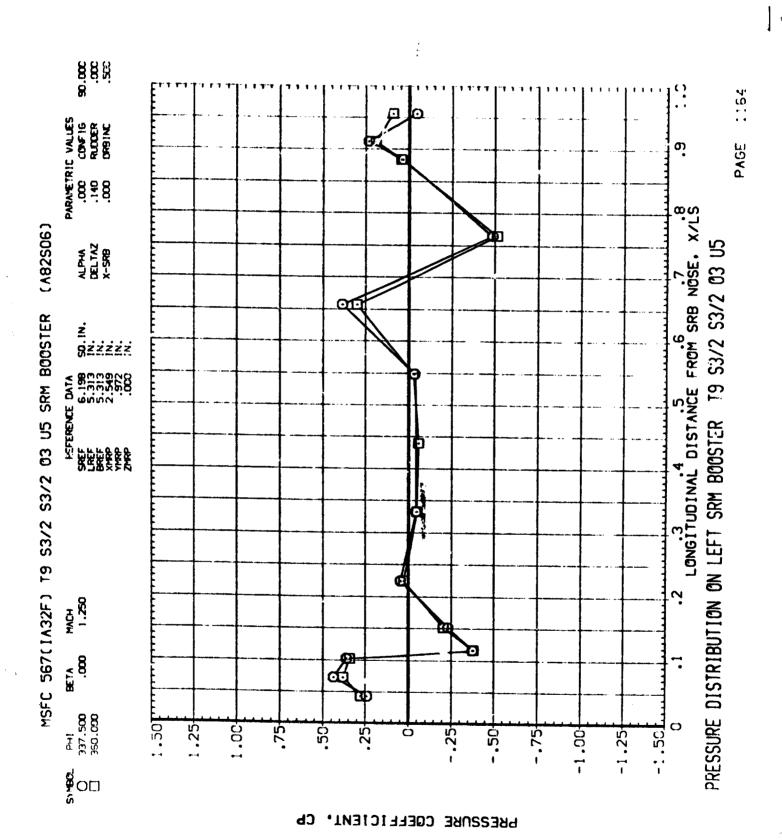
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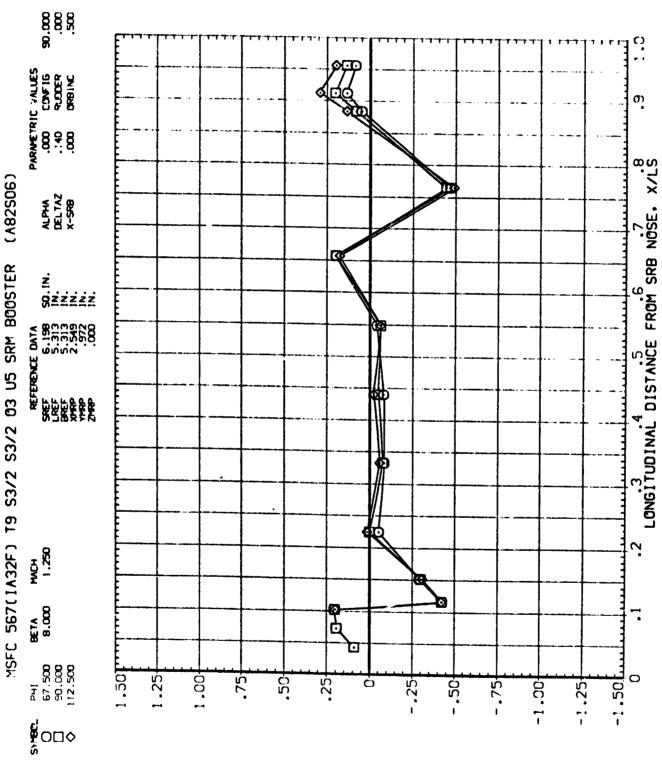






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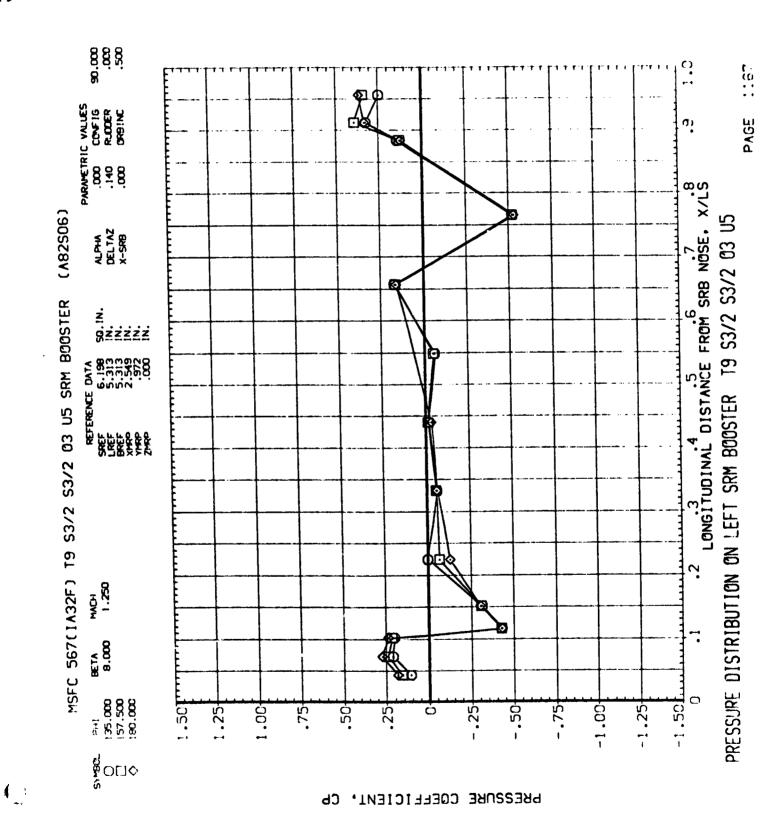
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PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER

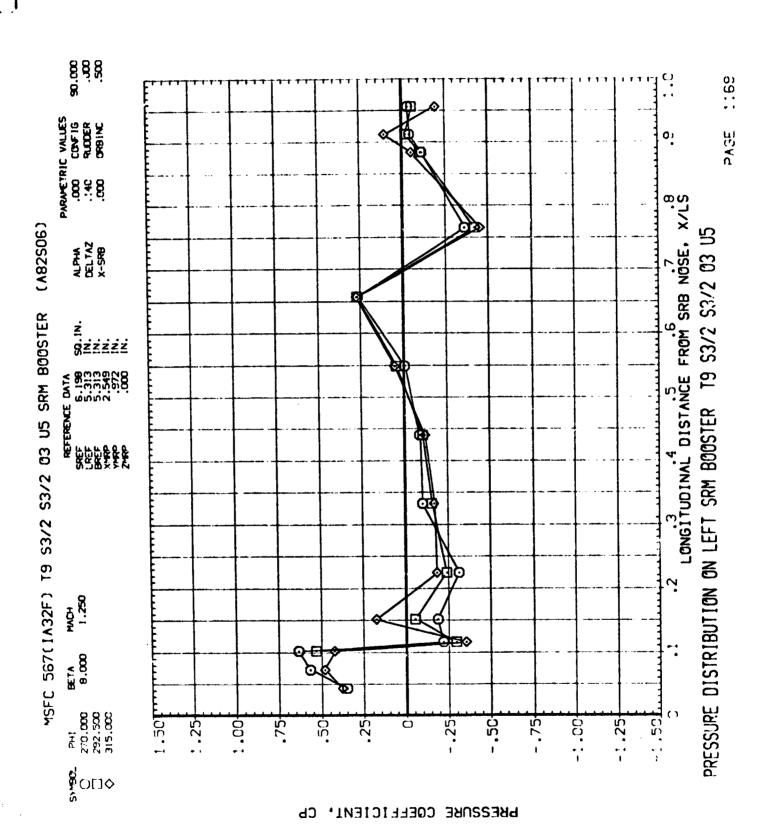
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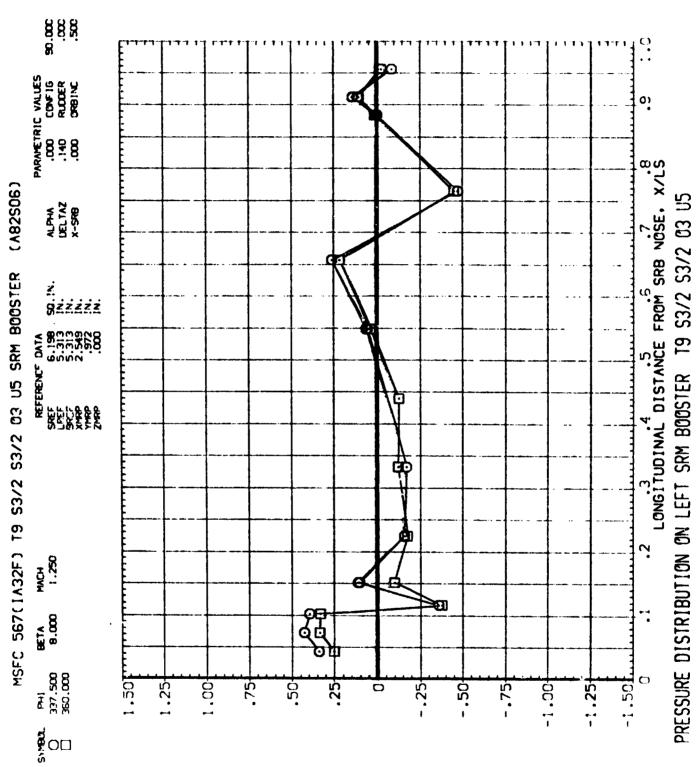
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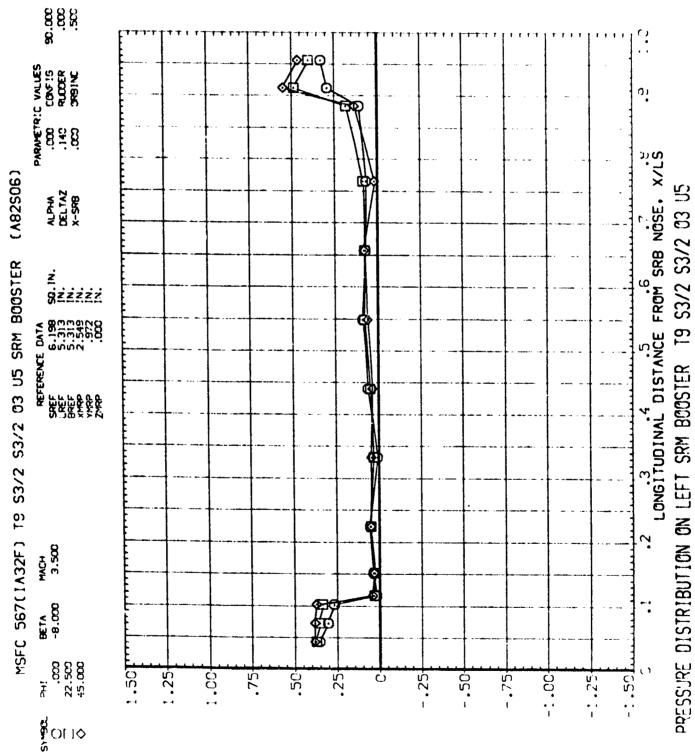
PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER T9 S3/2 S3/2 03 U5

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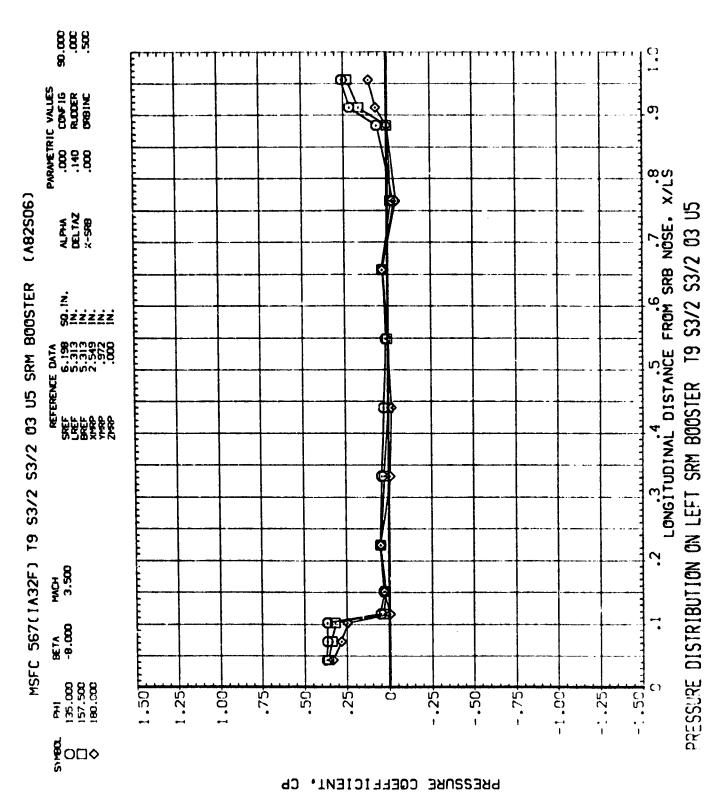
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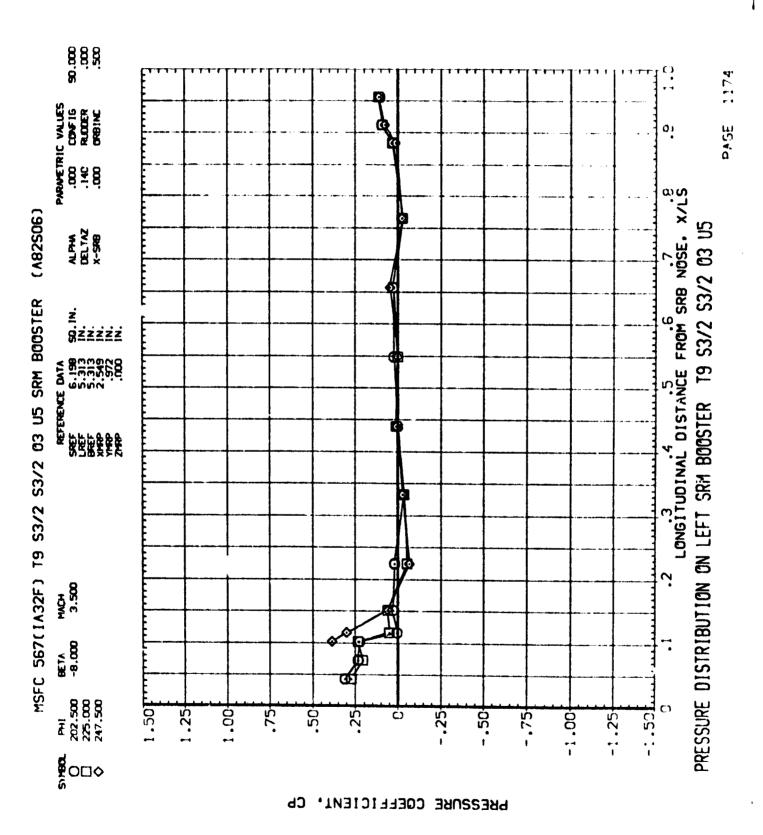


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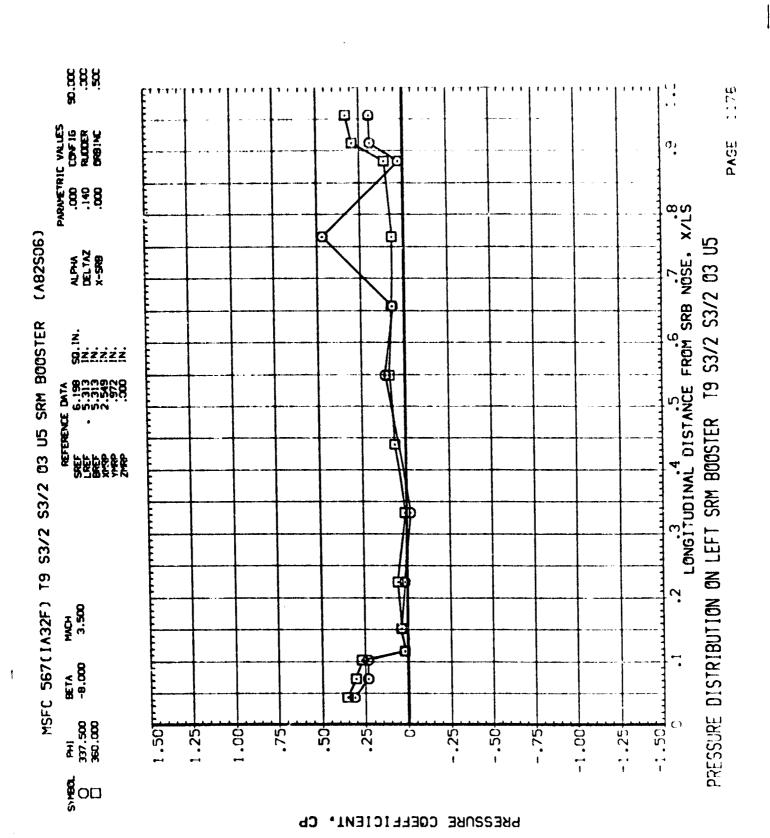


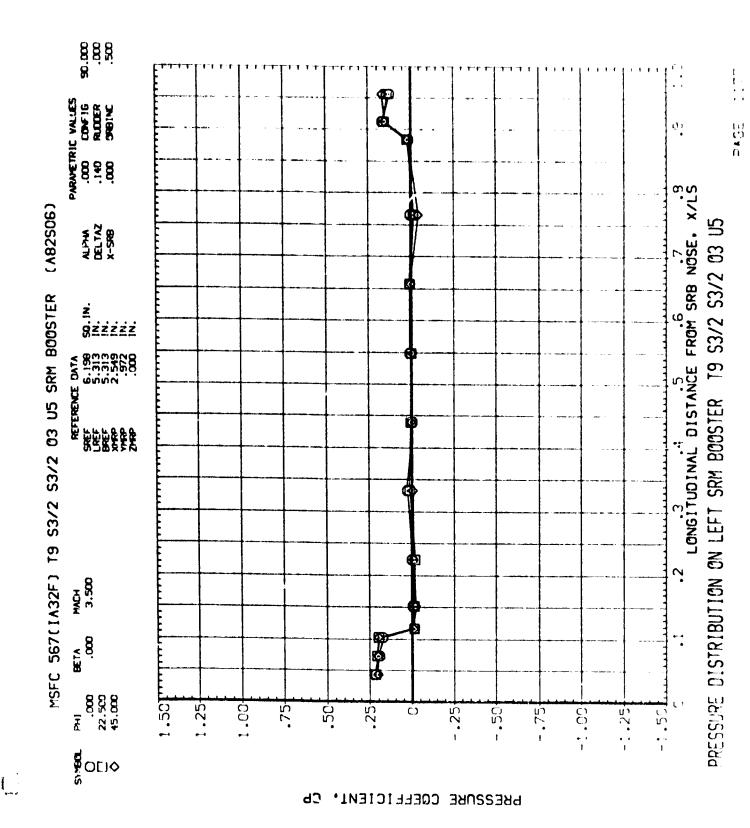


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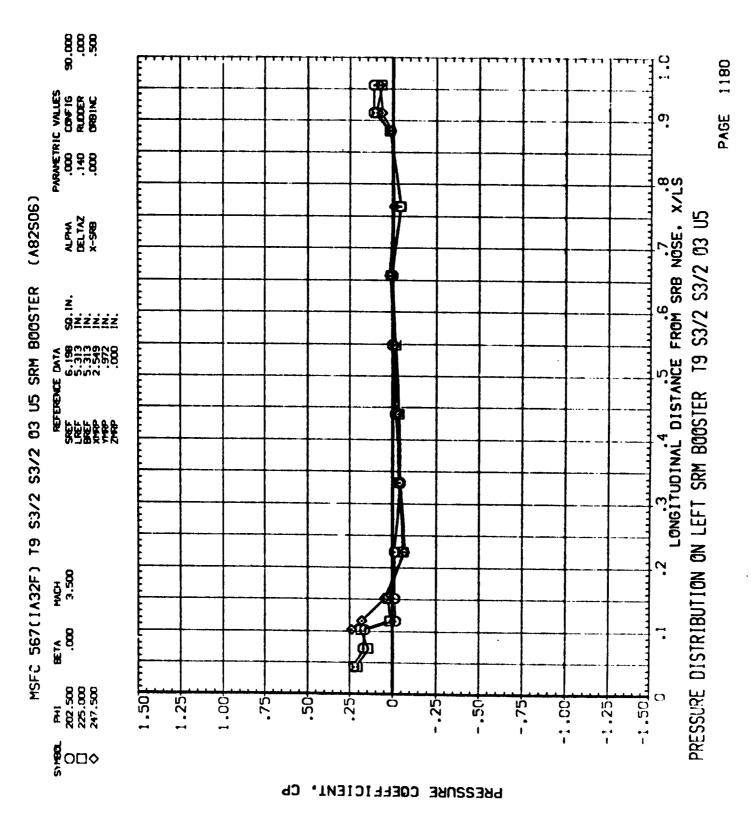




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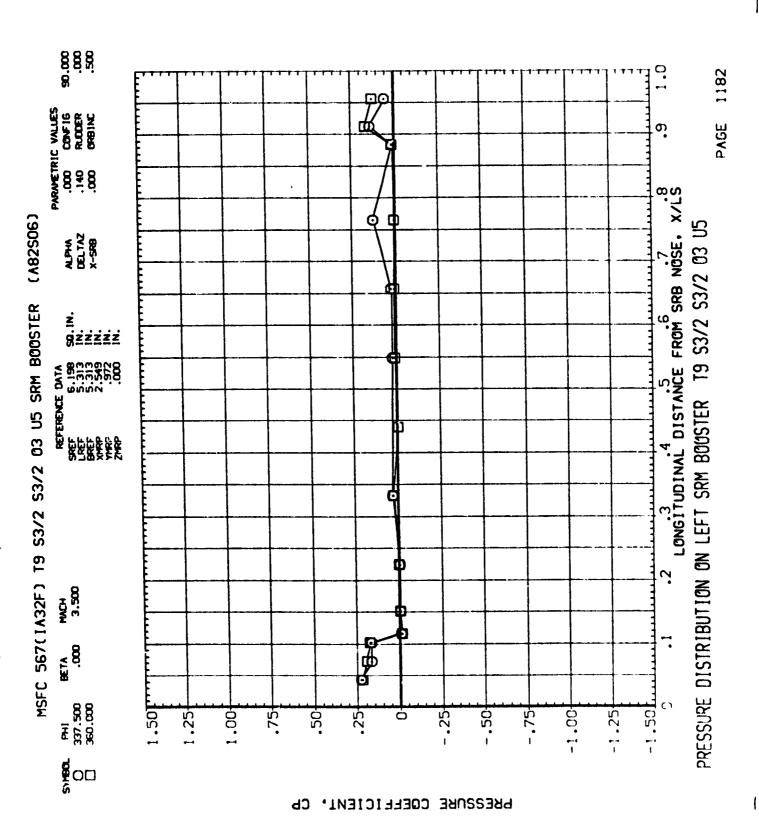
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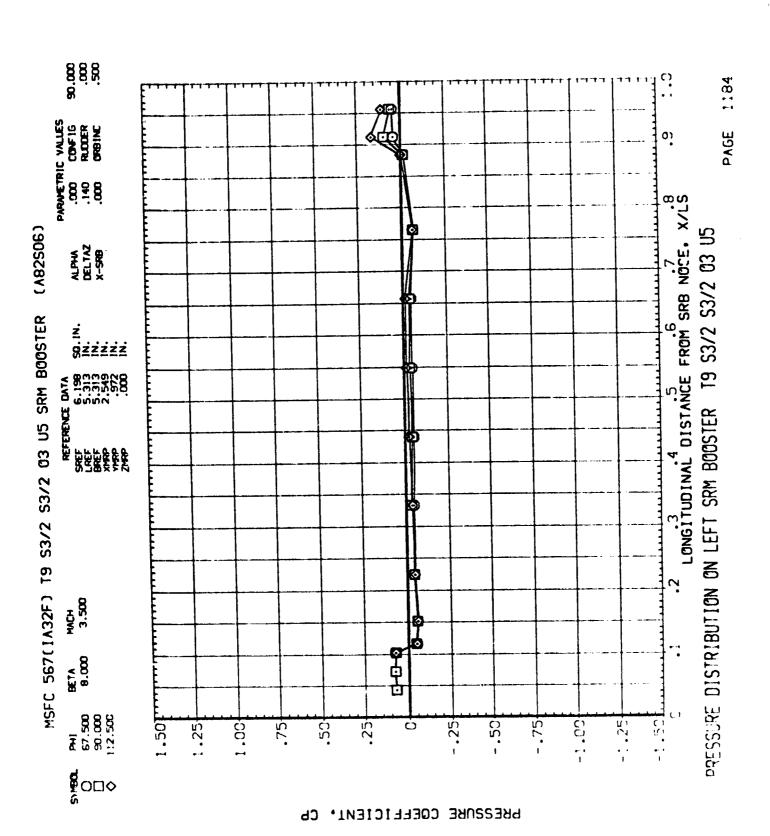


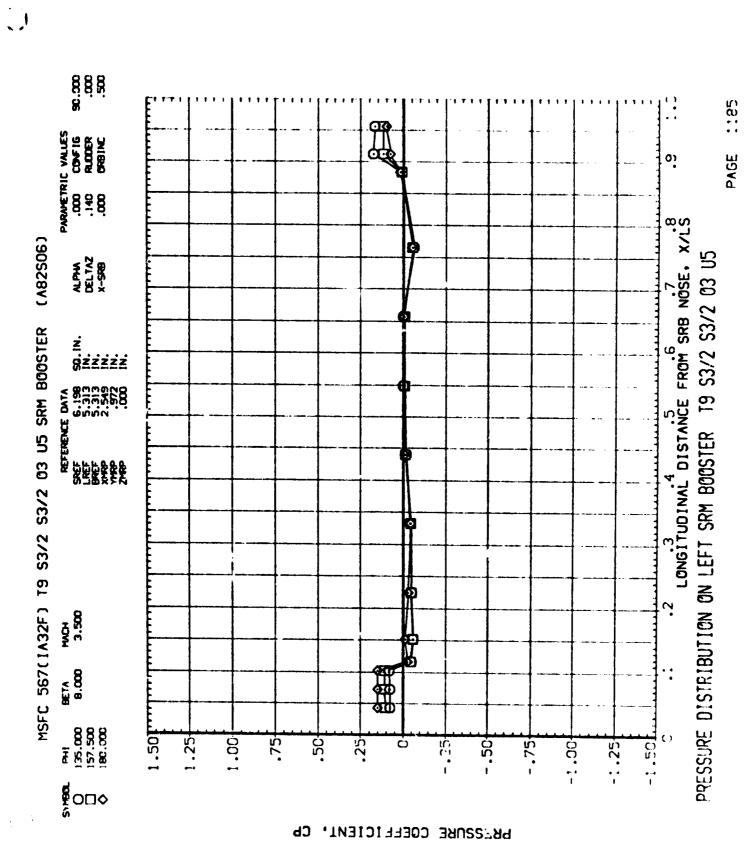
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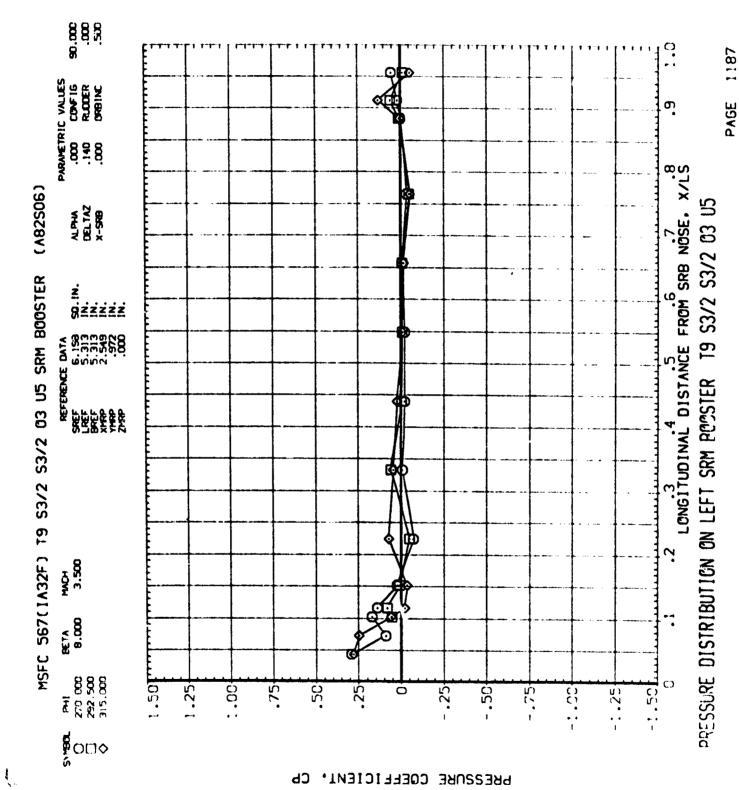
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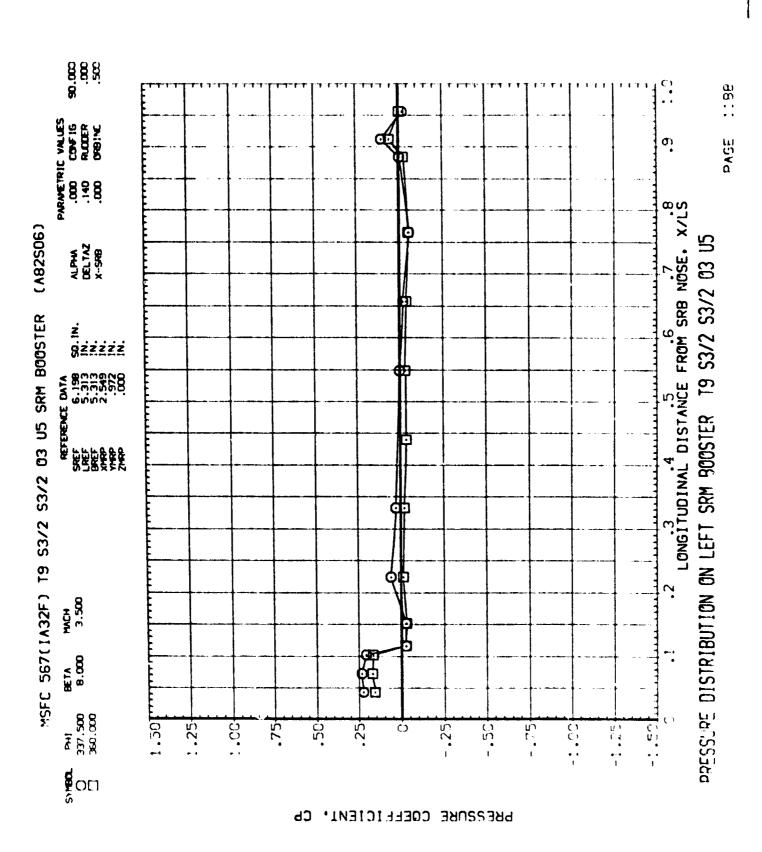
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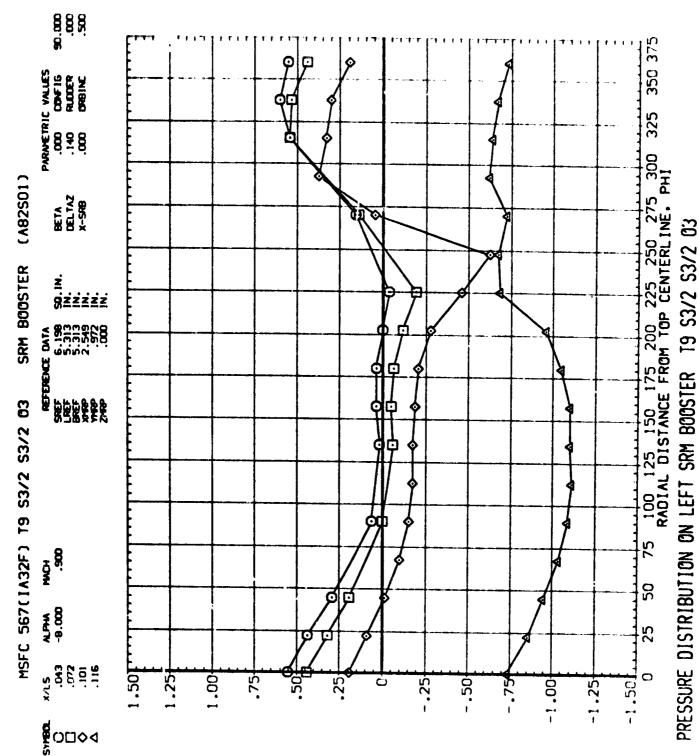




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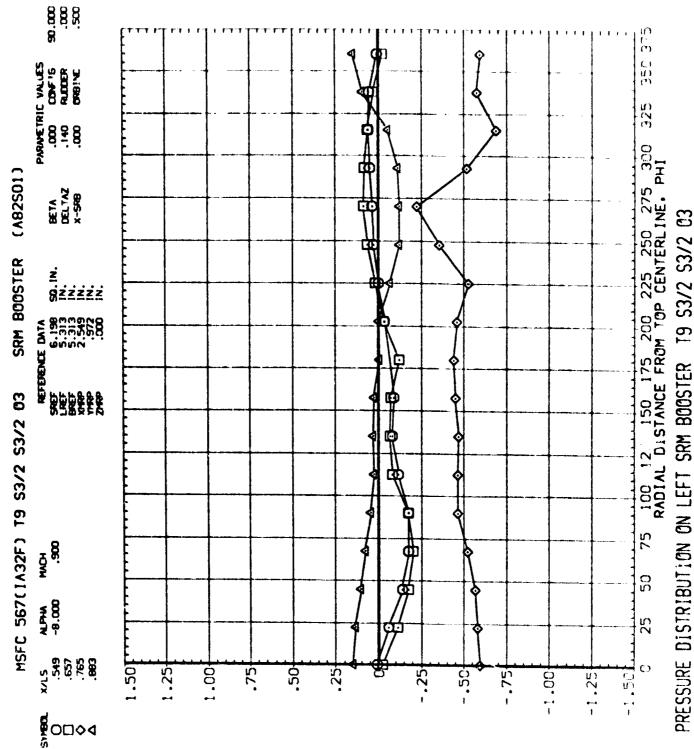




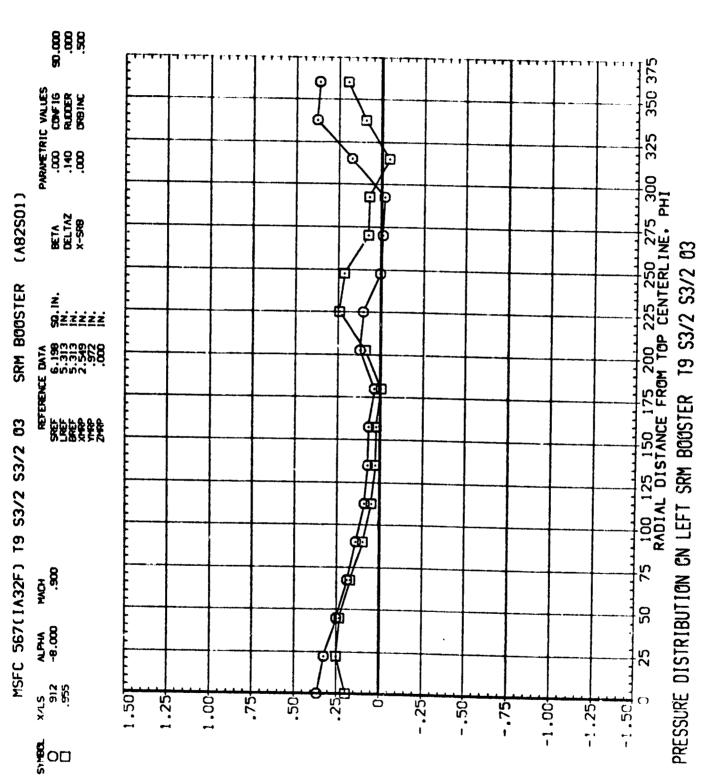
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PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER 19 S3/2 S3/2 03

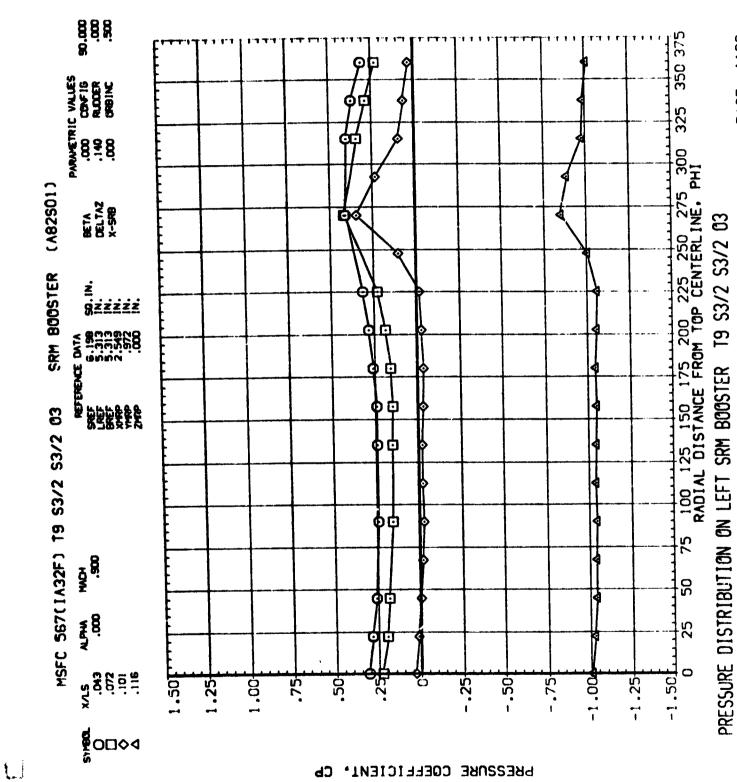
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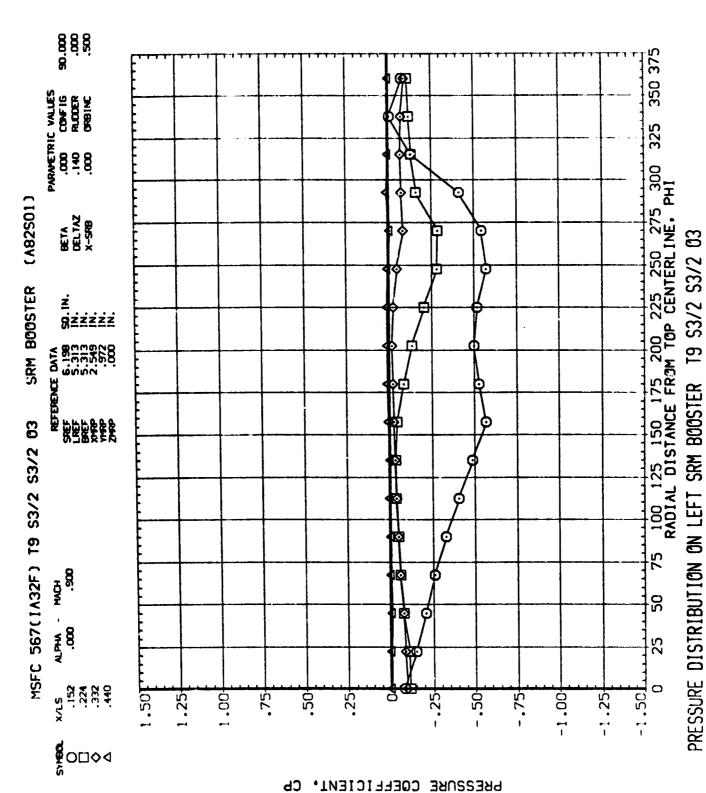
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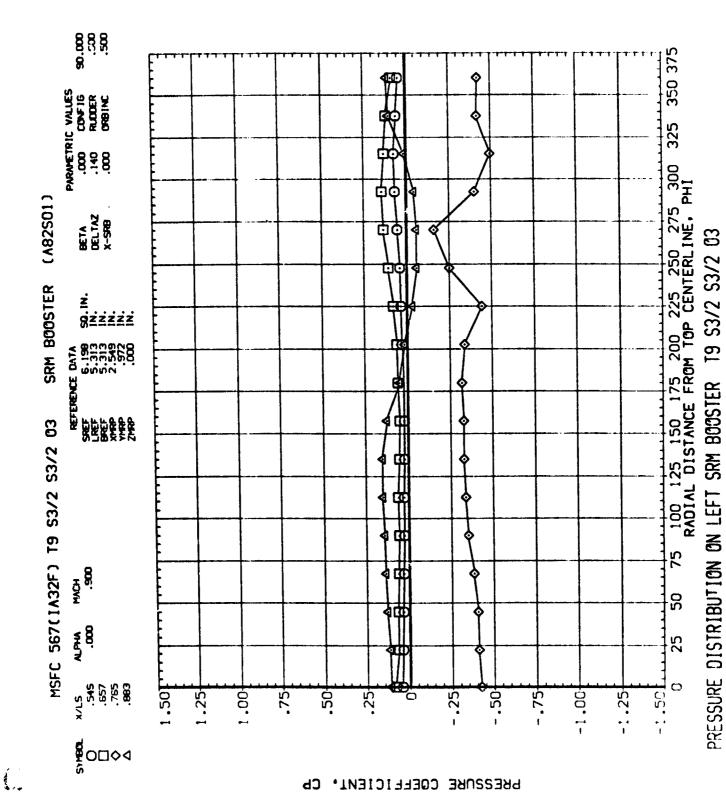


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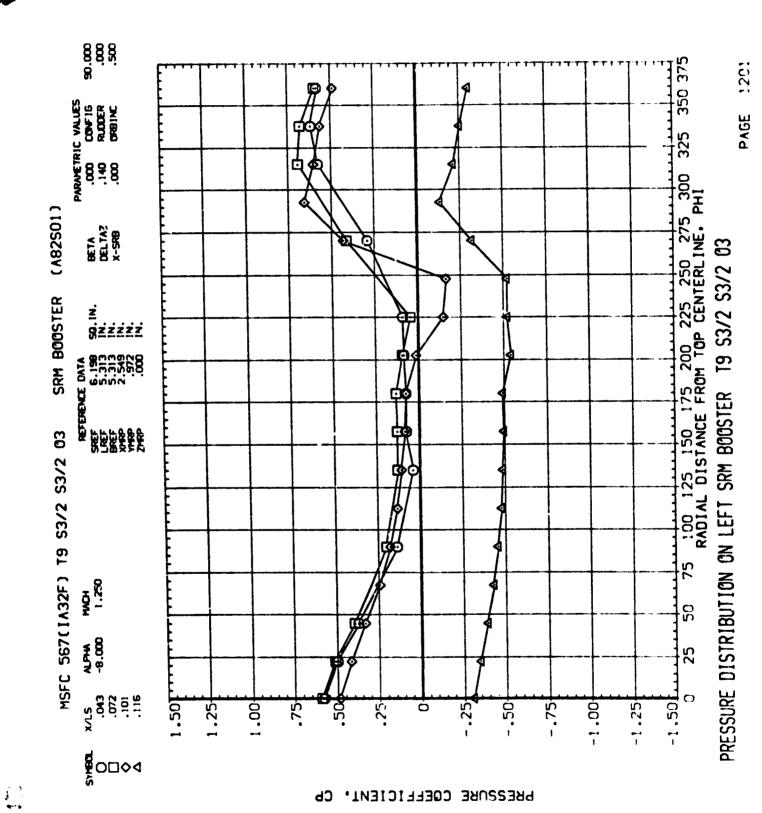
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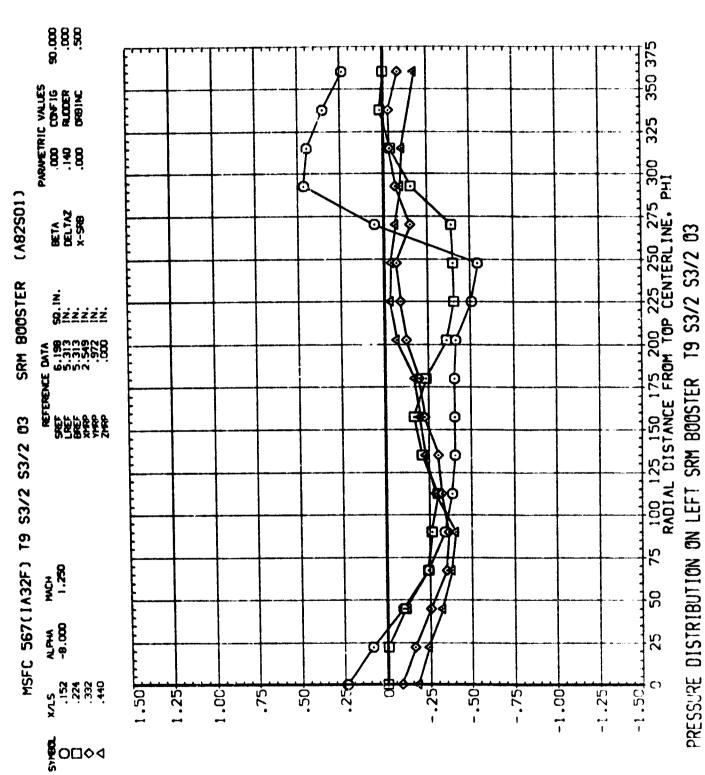
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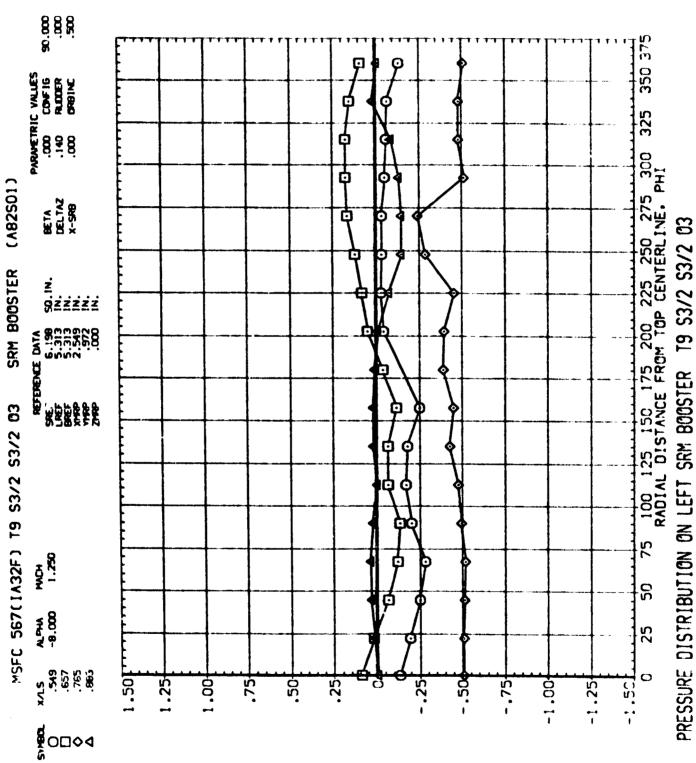
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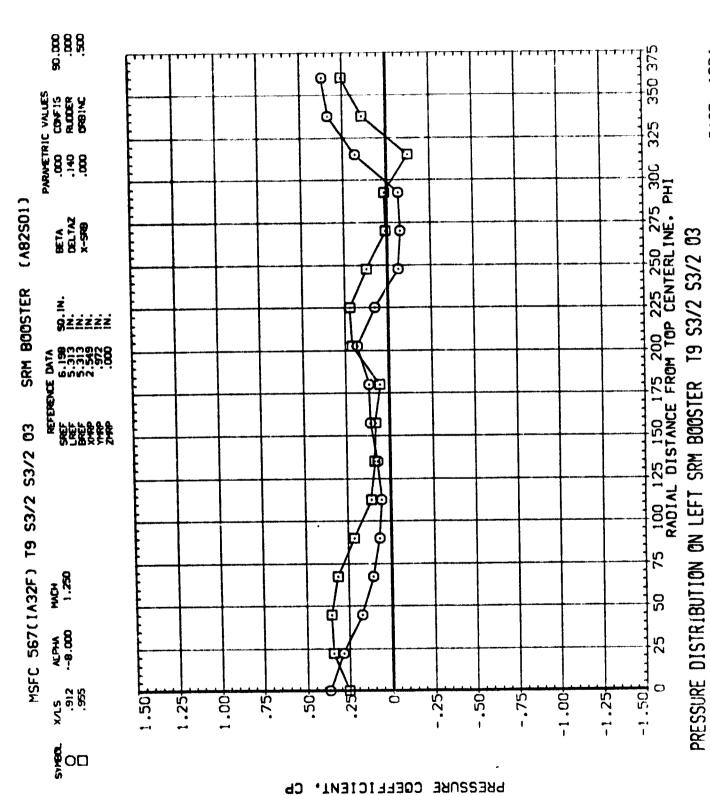


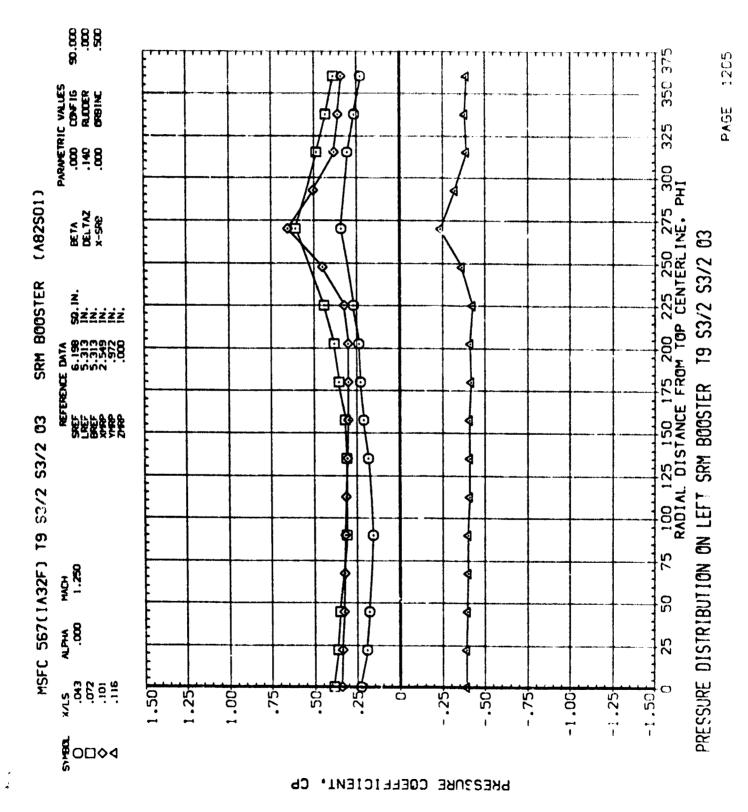


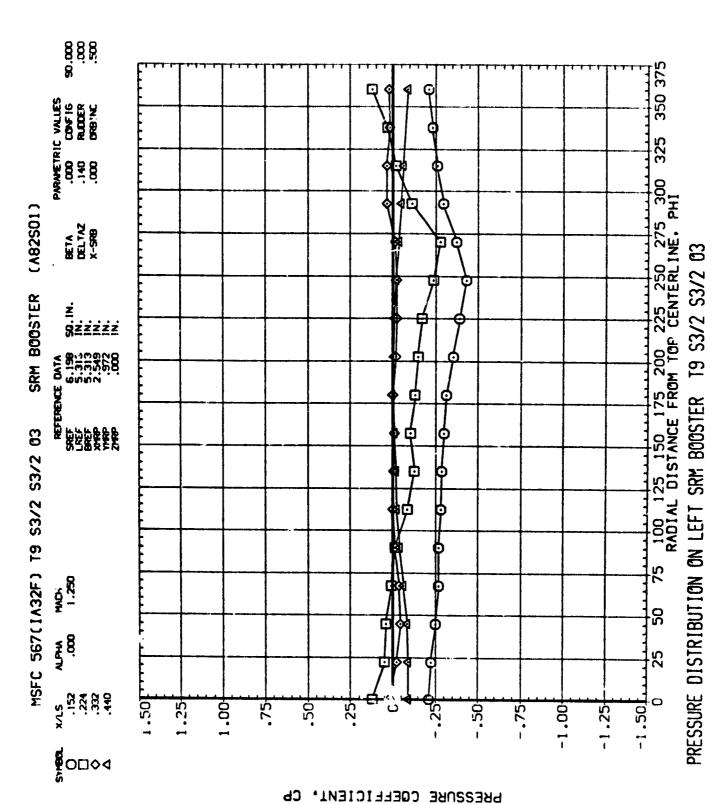
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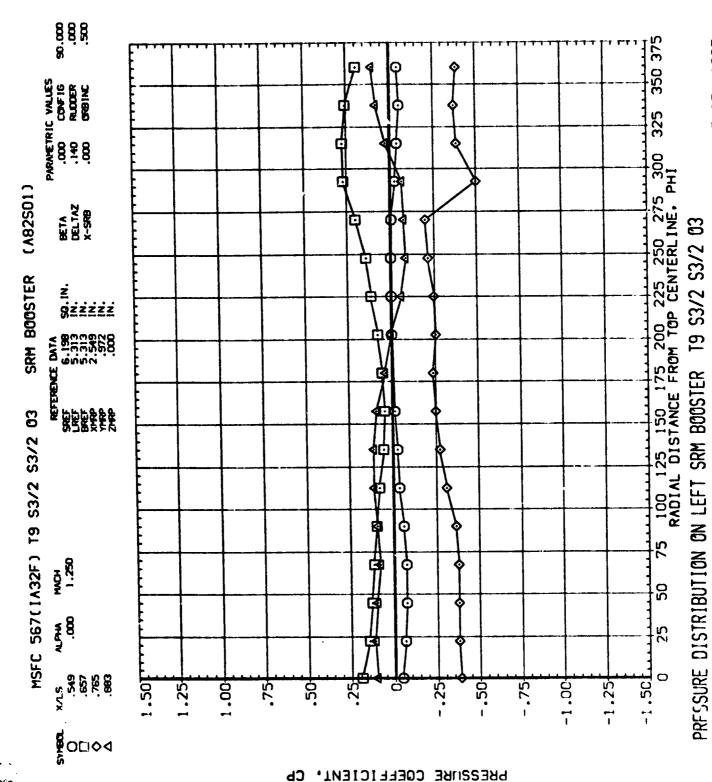


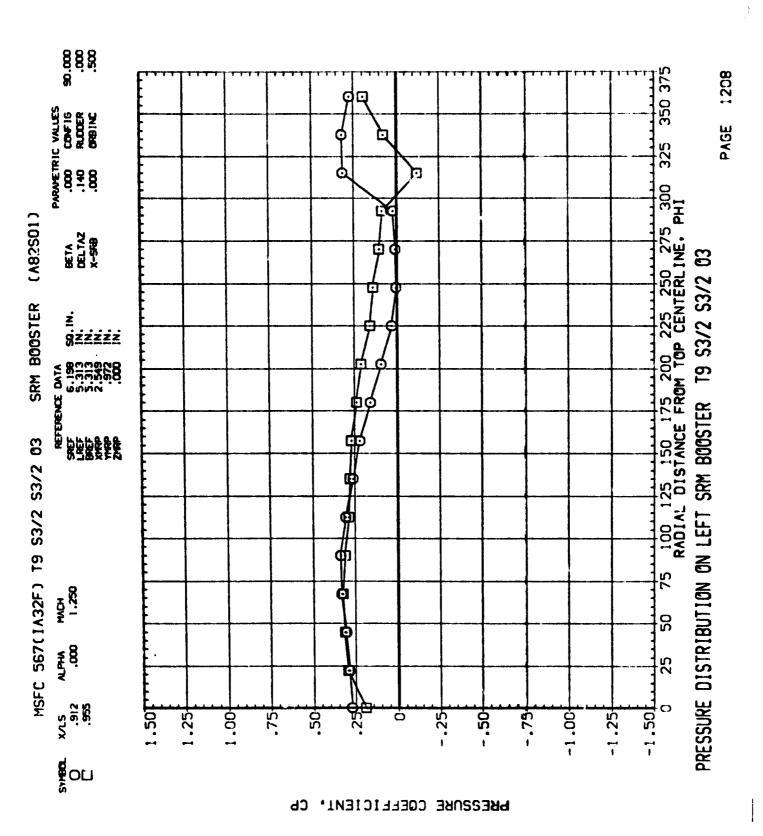
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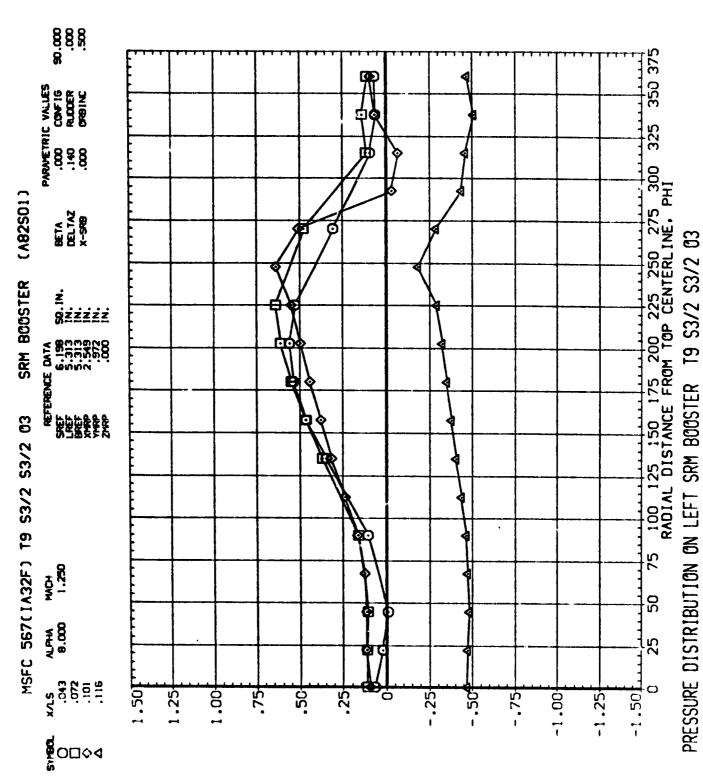




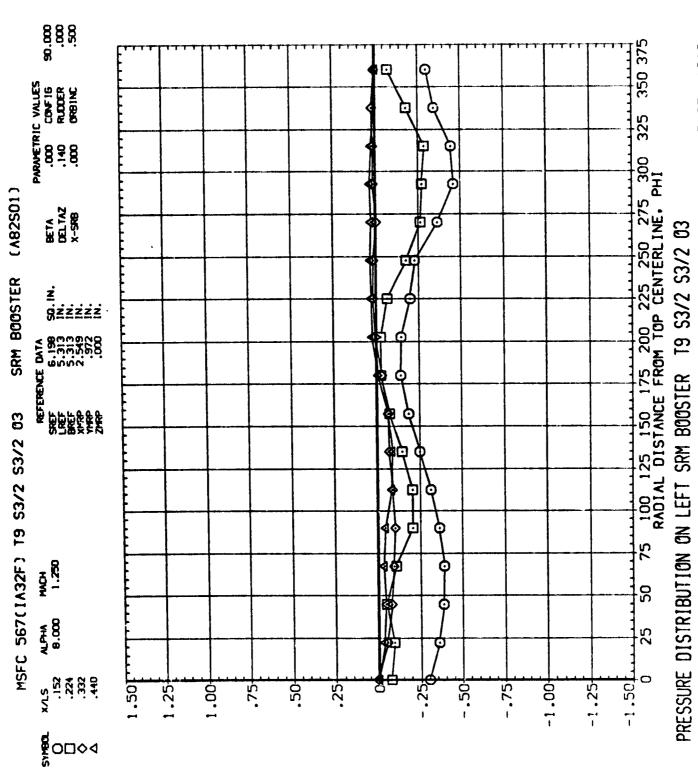




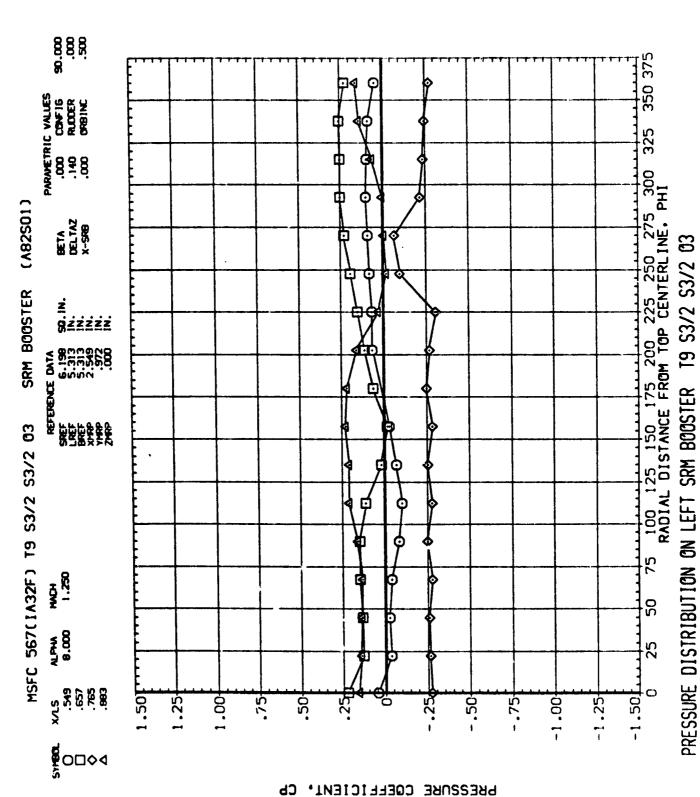


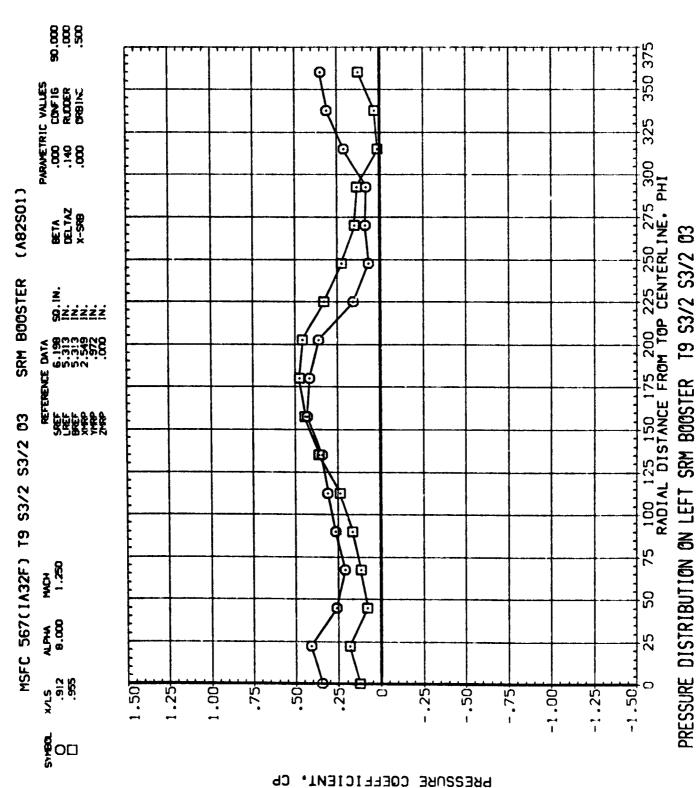


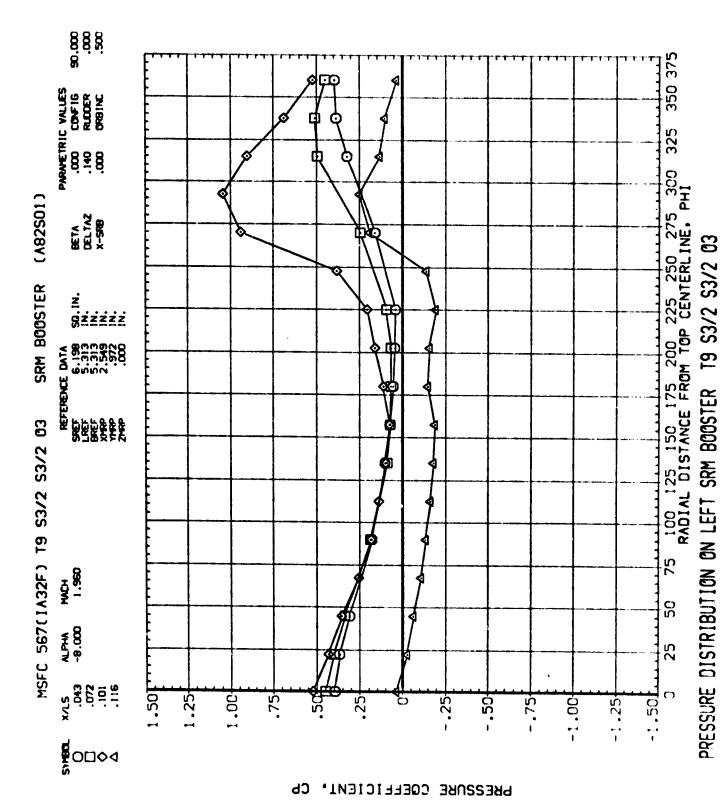
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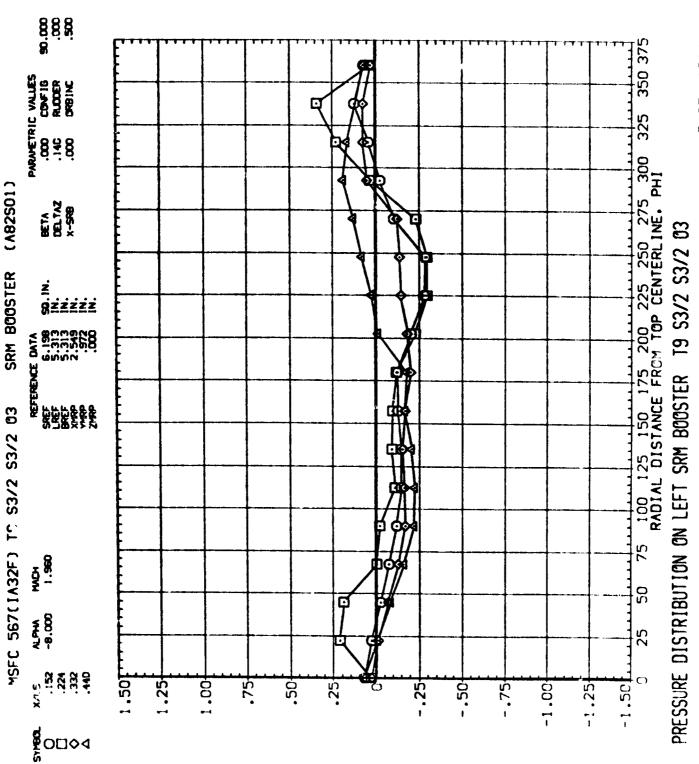
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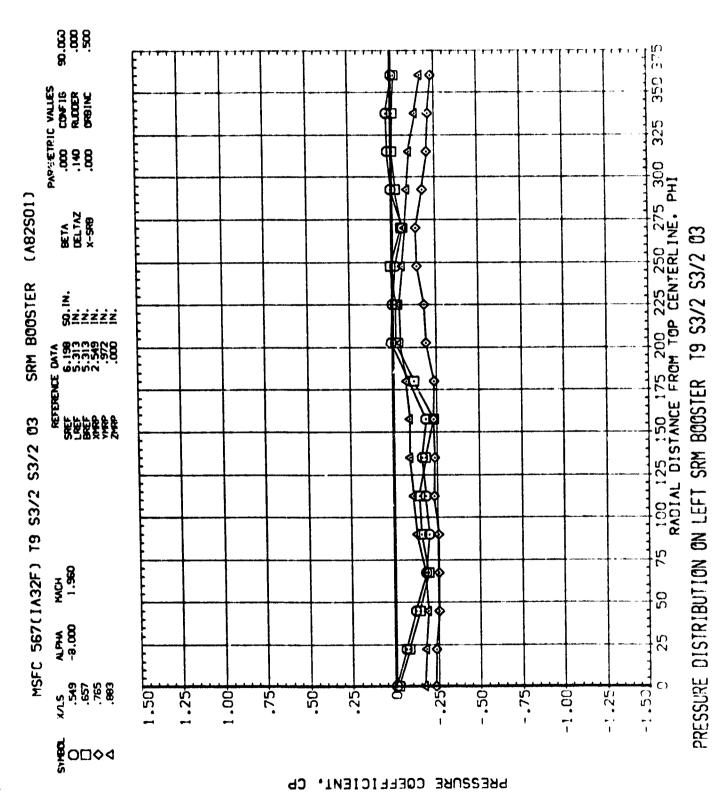


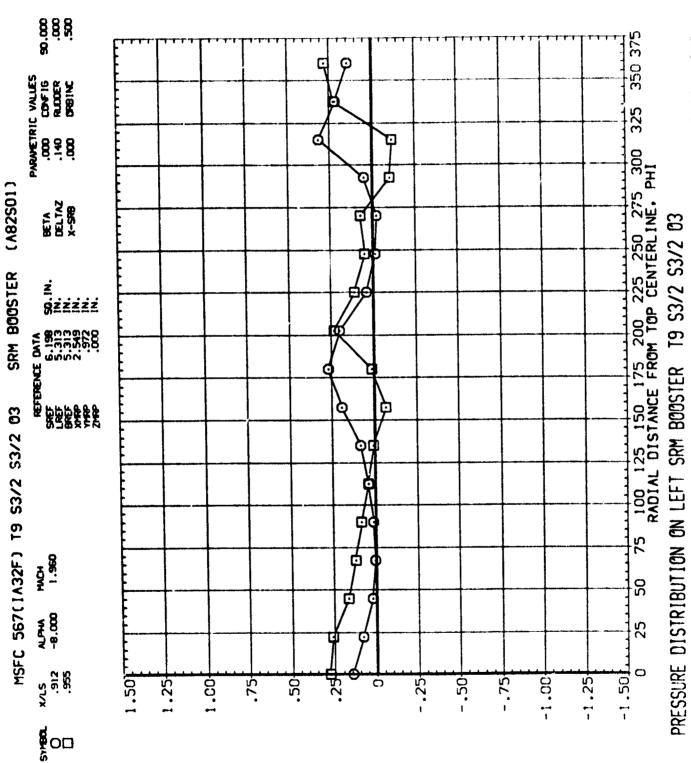


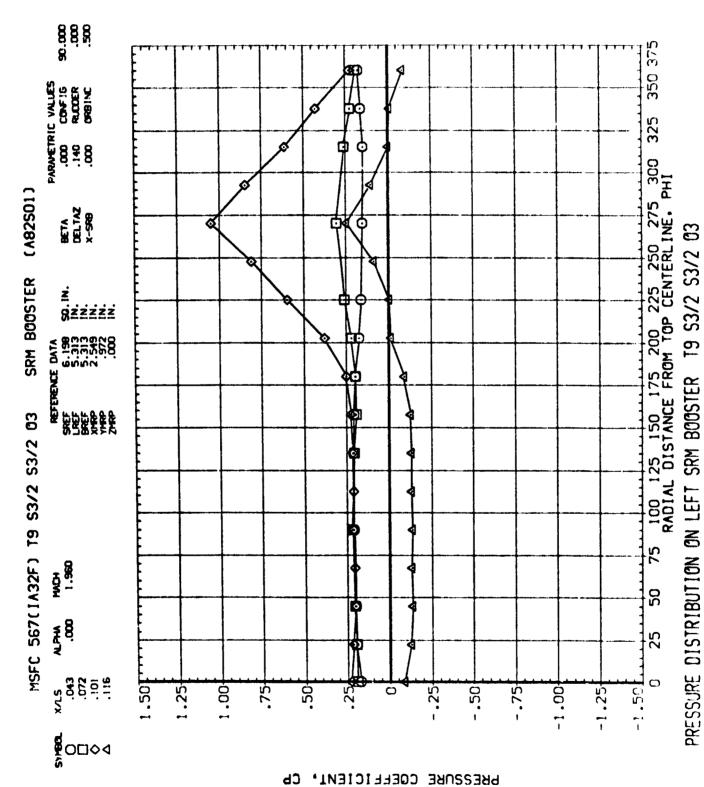
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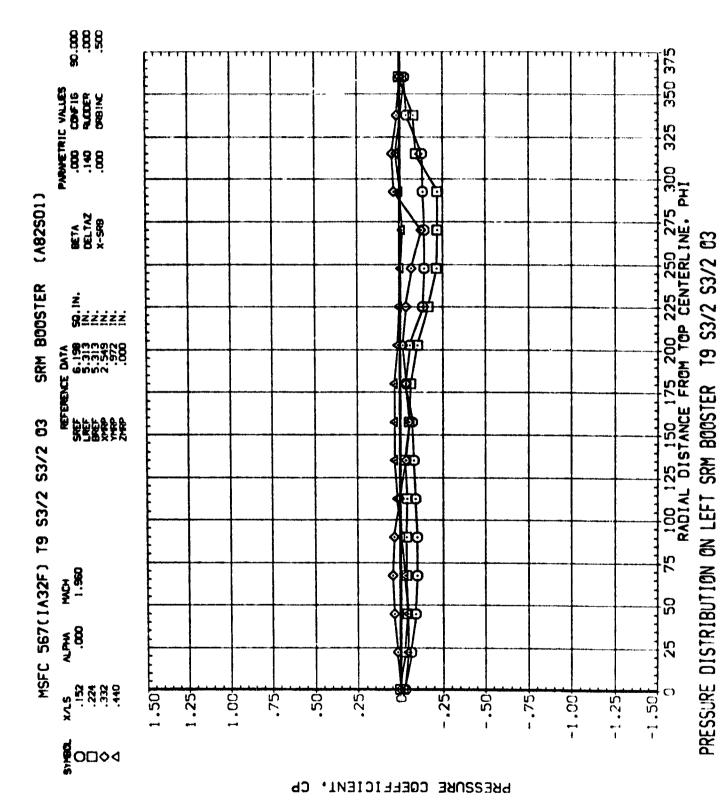


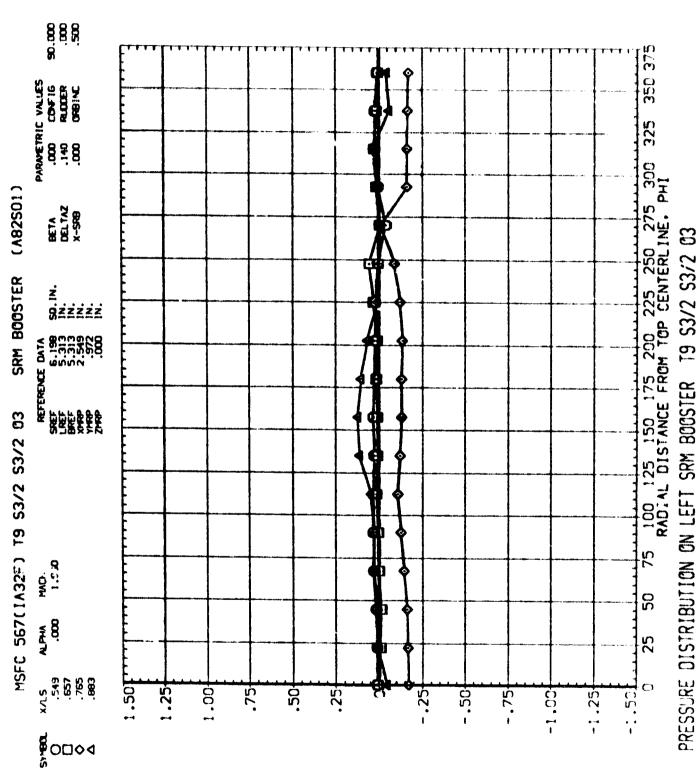
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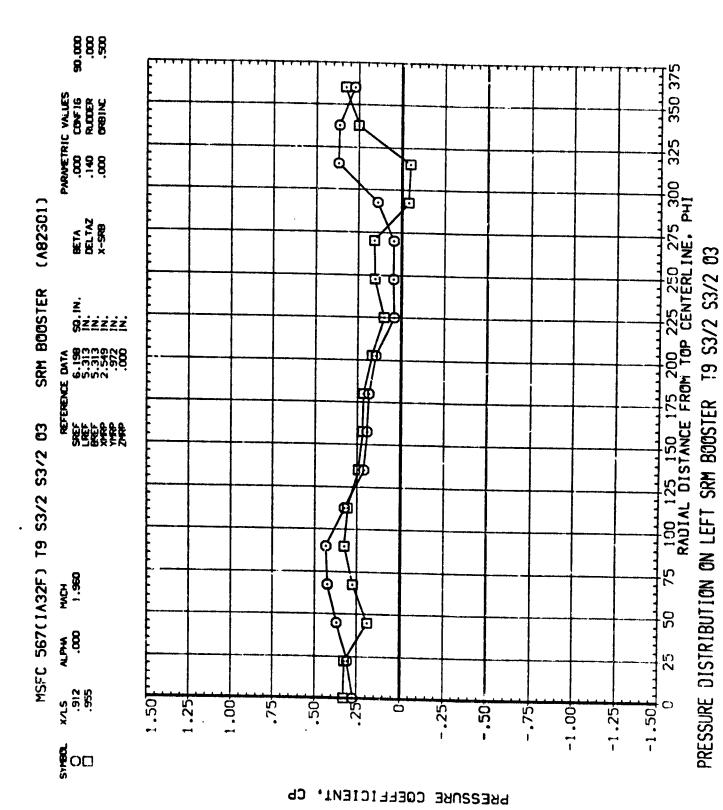


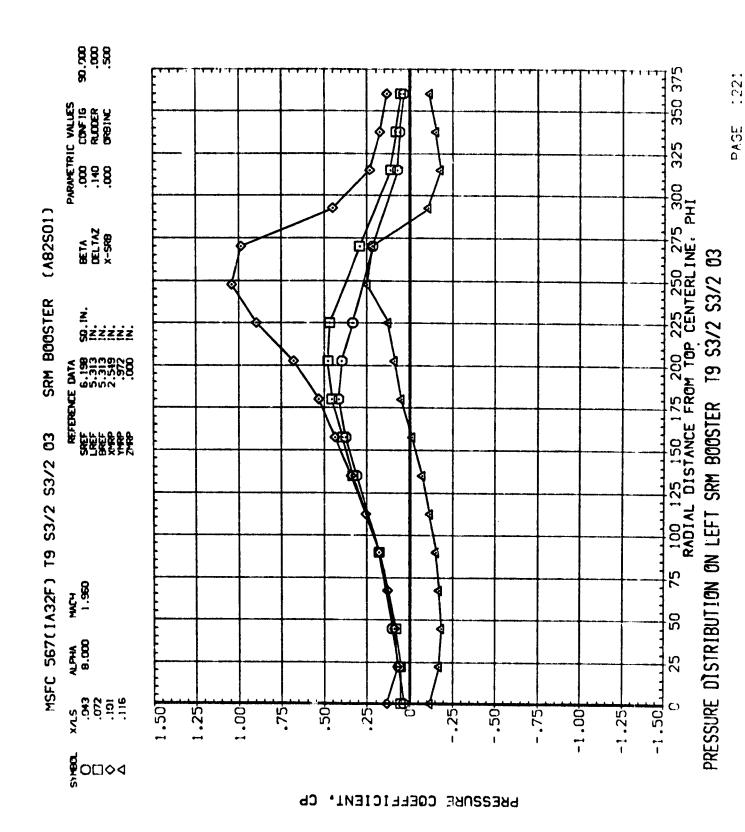


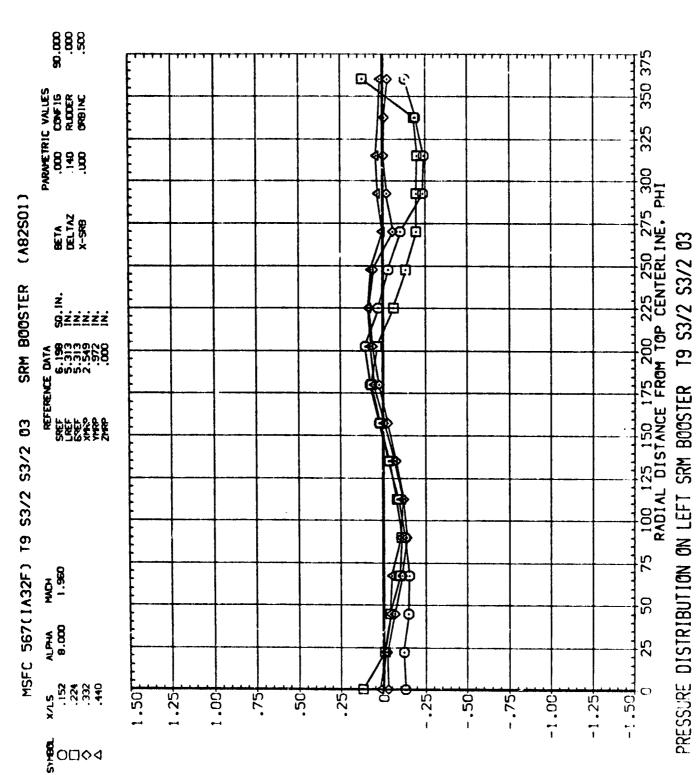


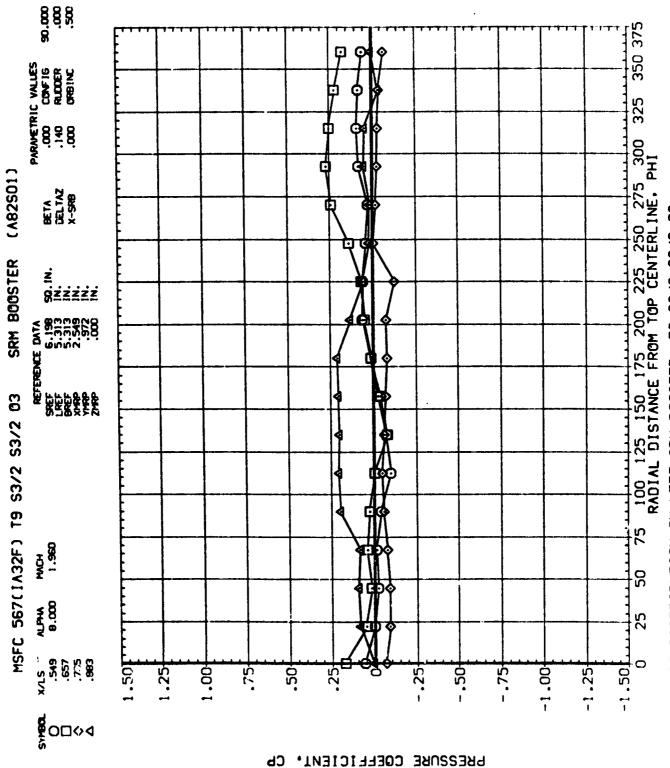


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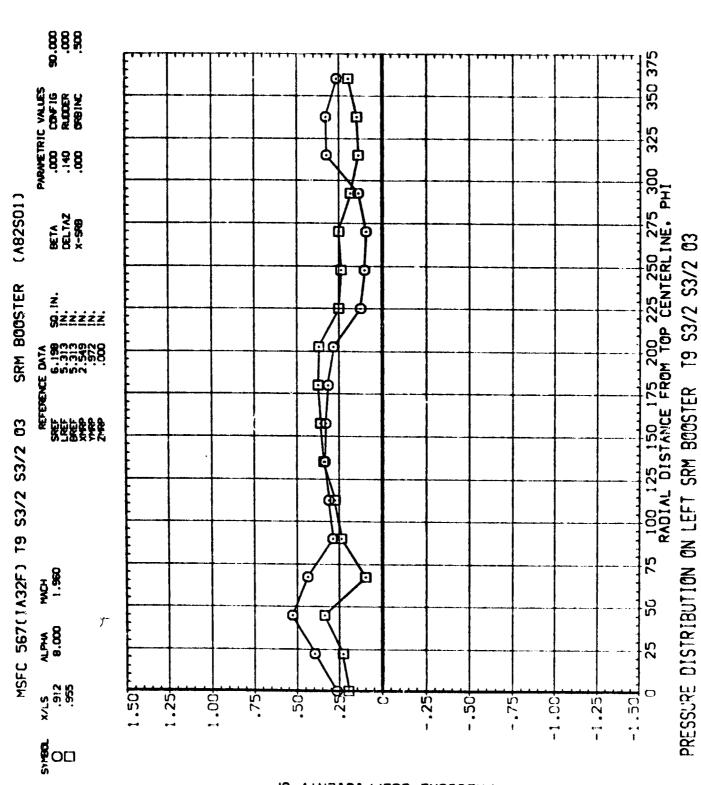




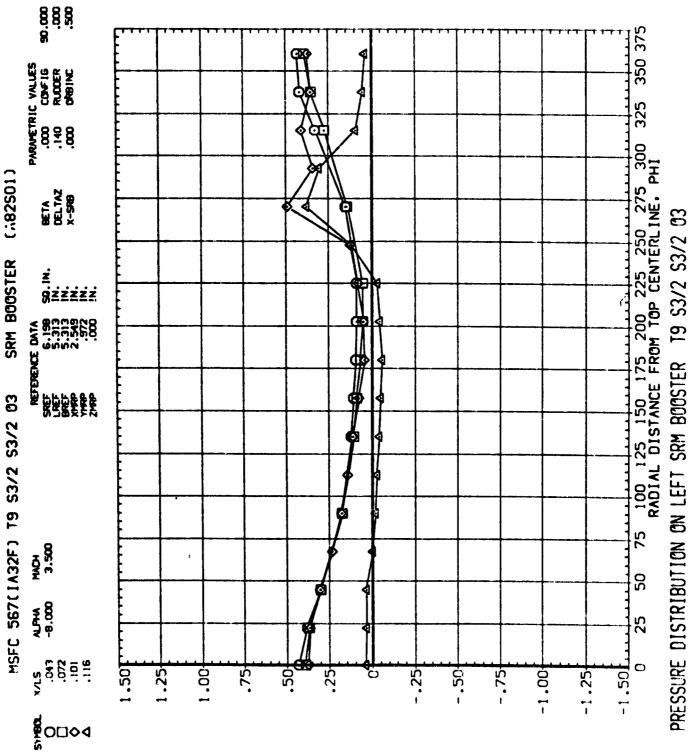




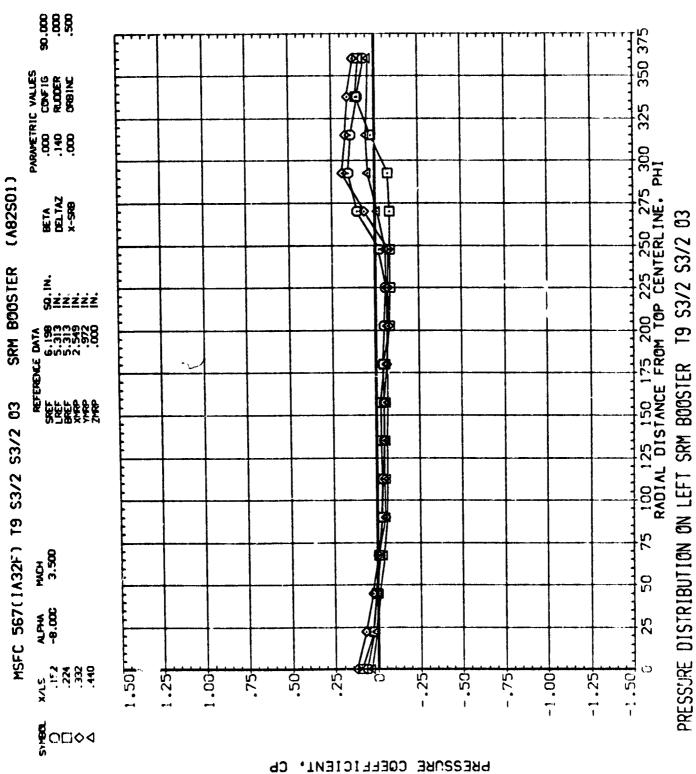
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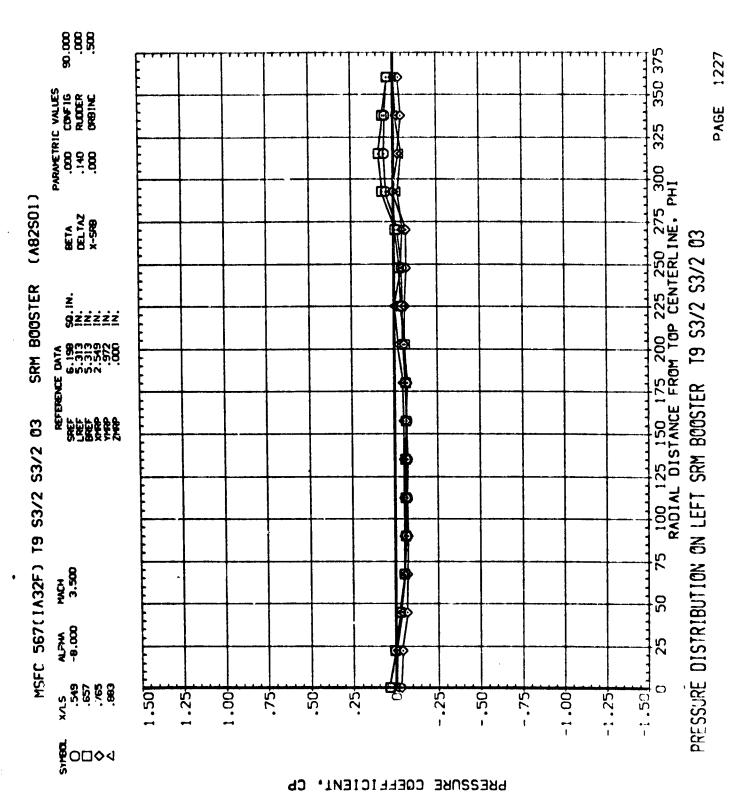
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PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER

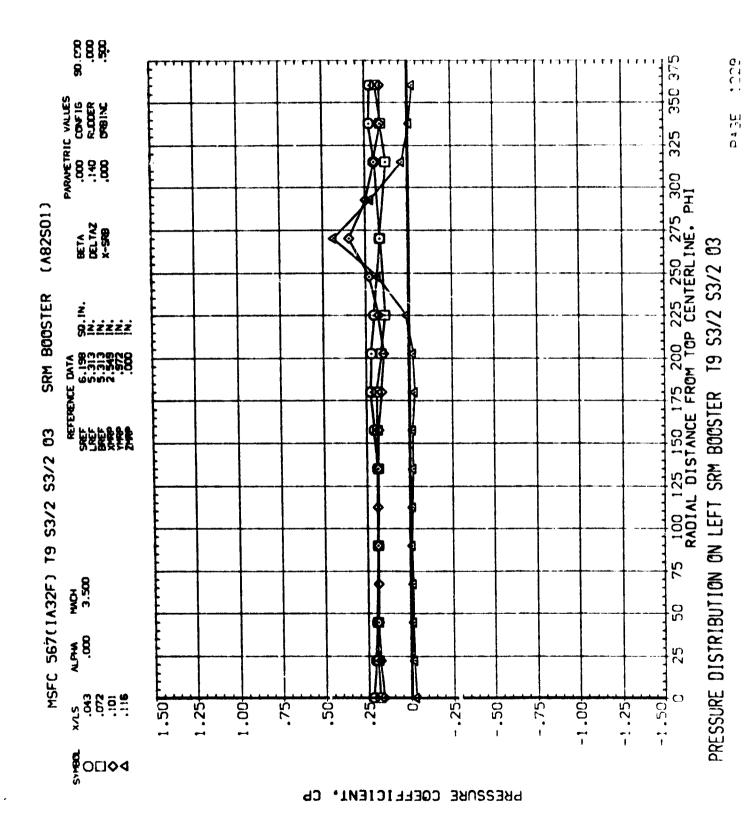


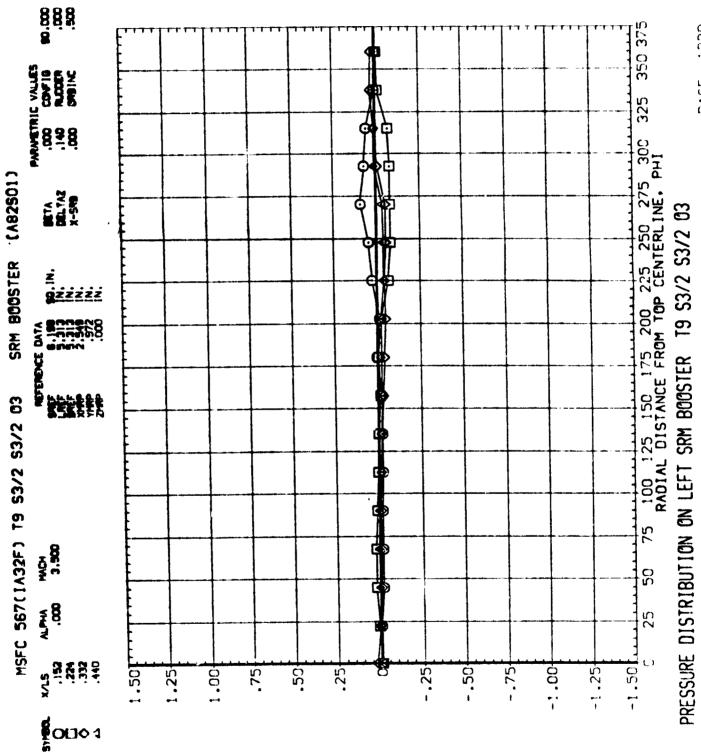
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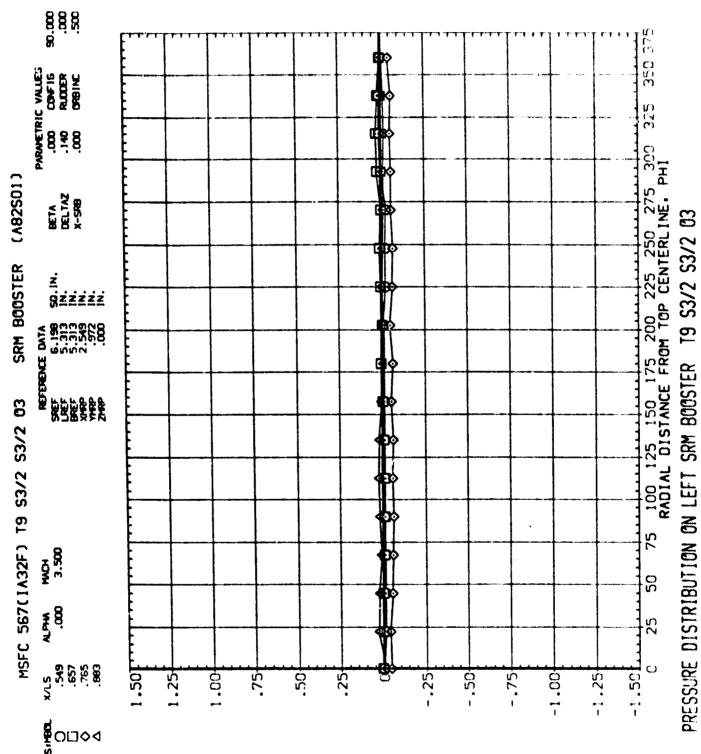
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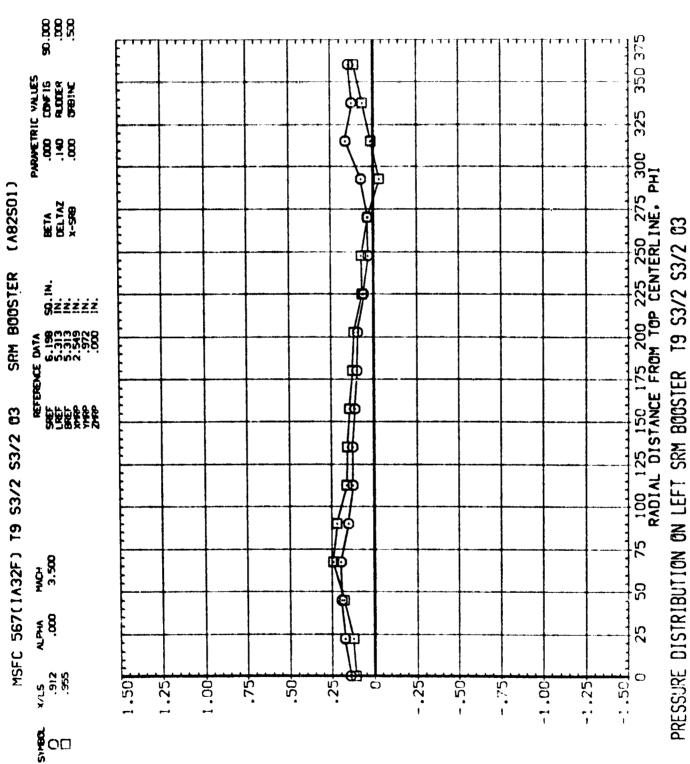




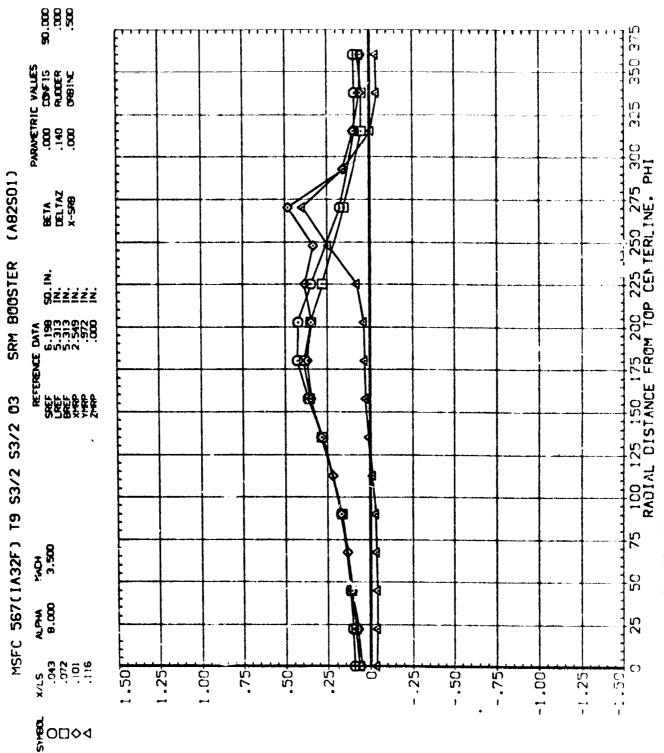
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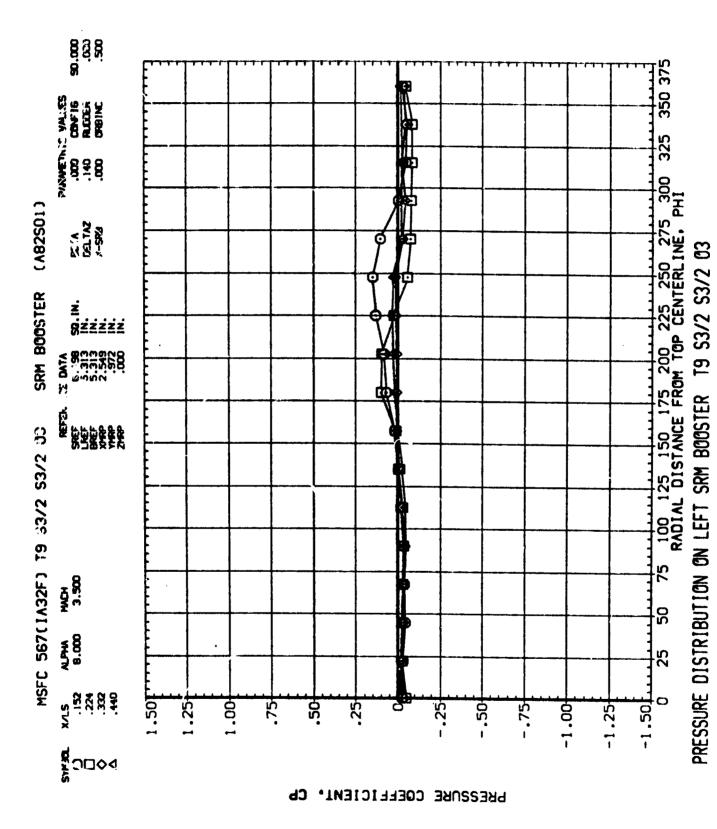
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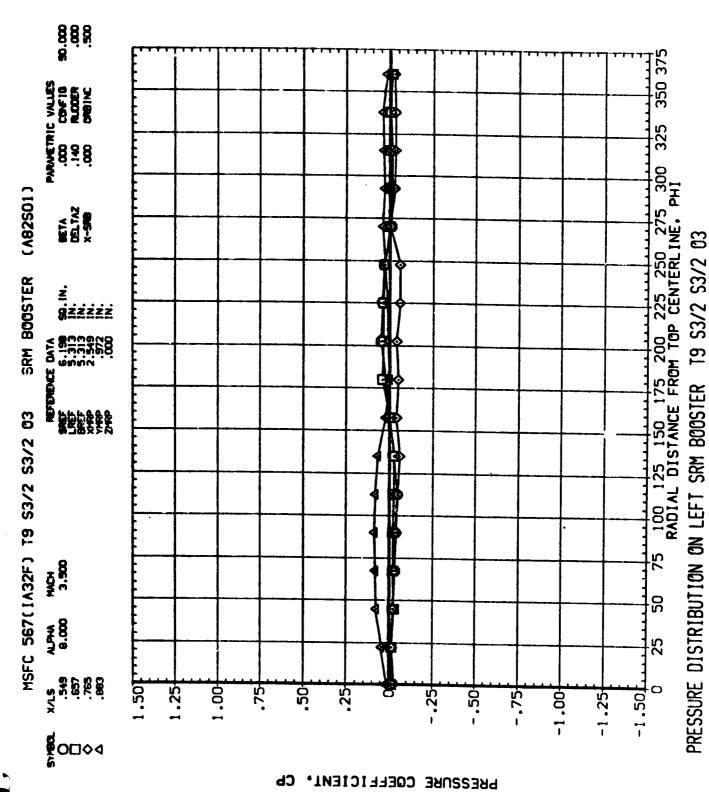


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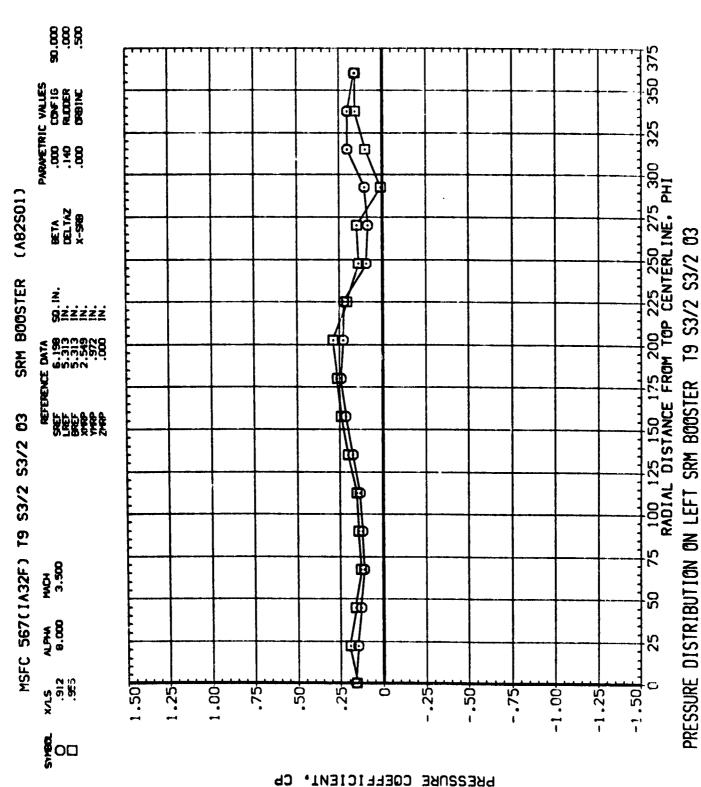


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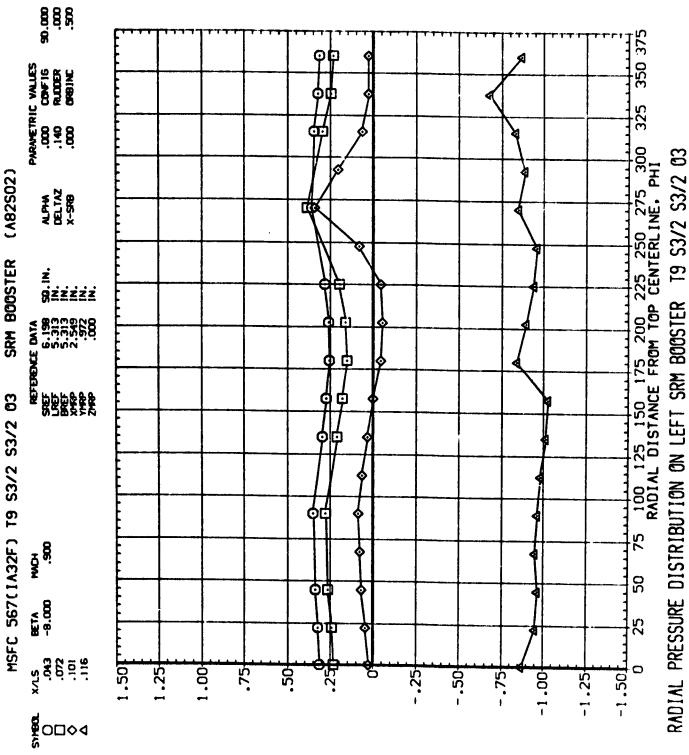




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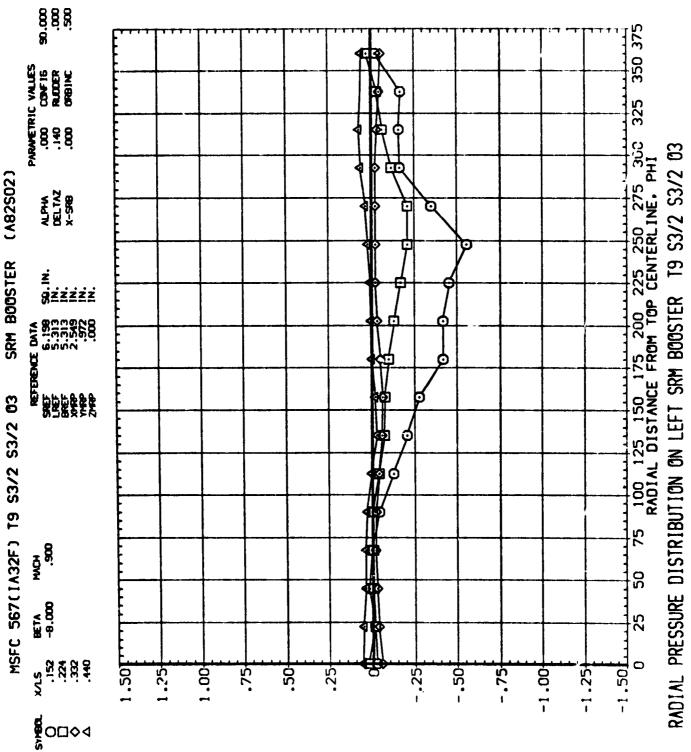
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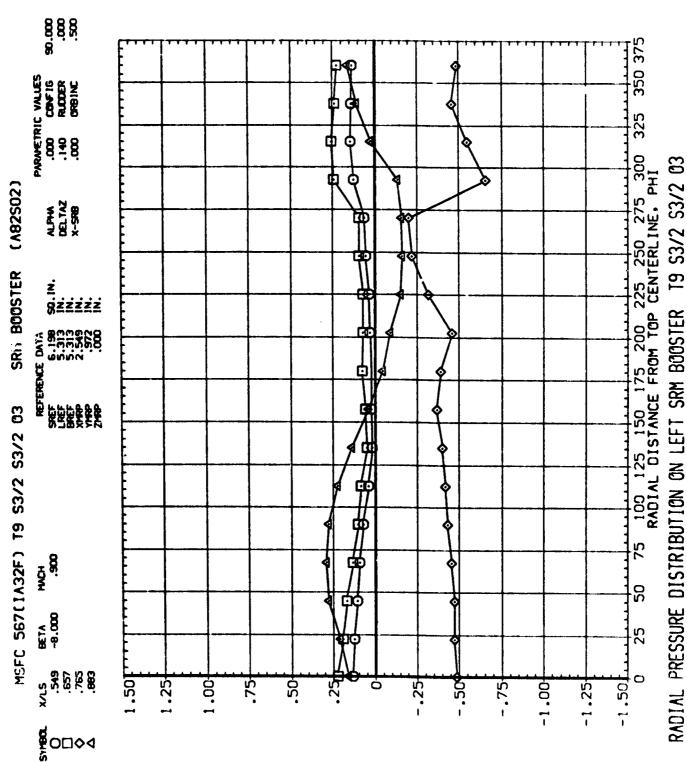


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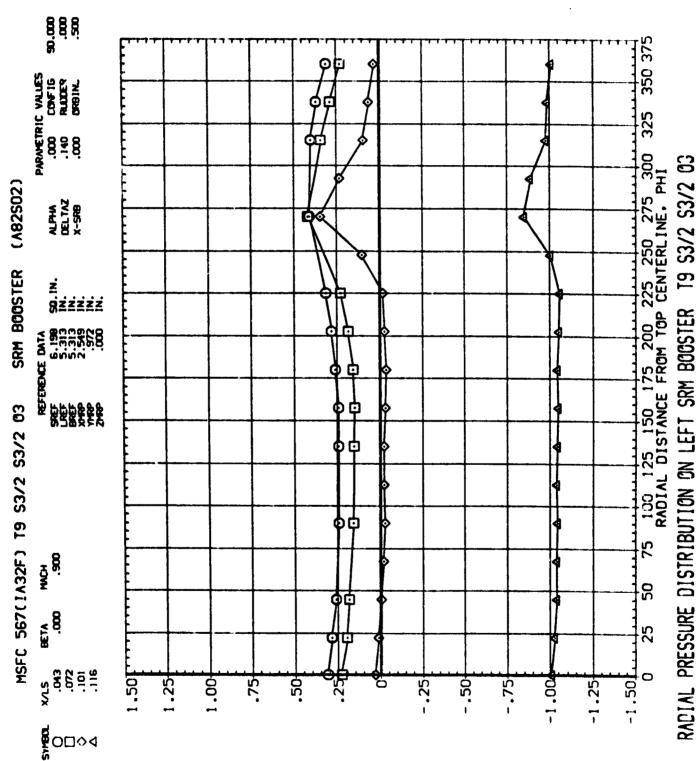
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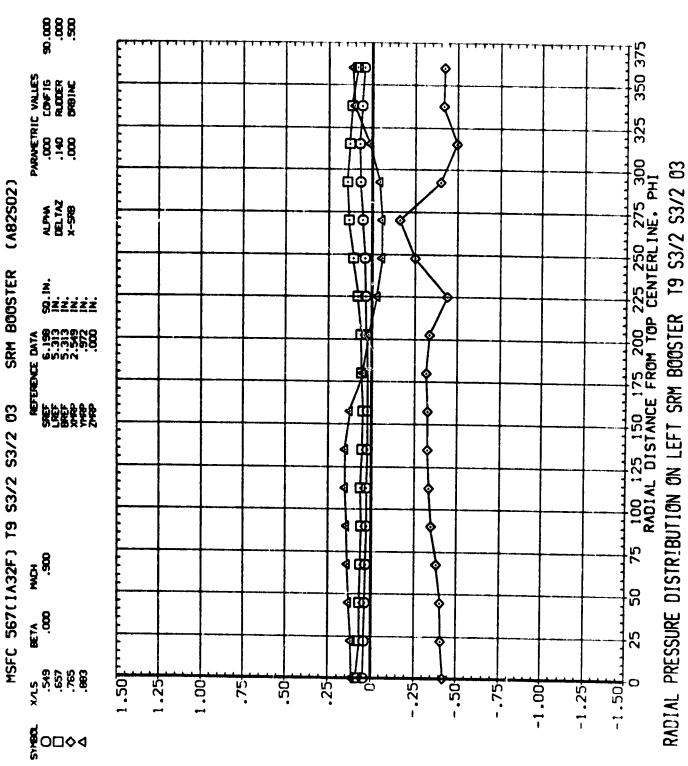


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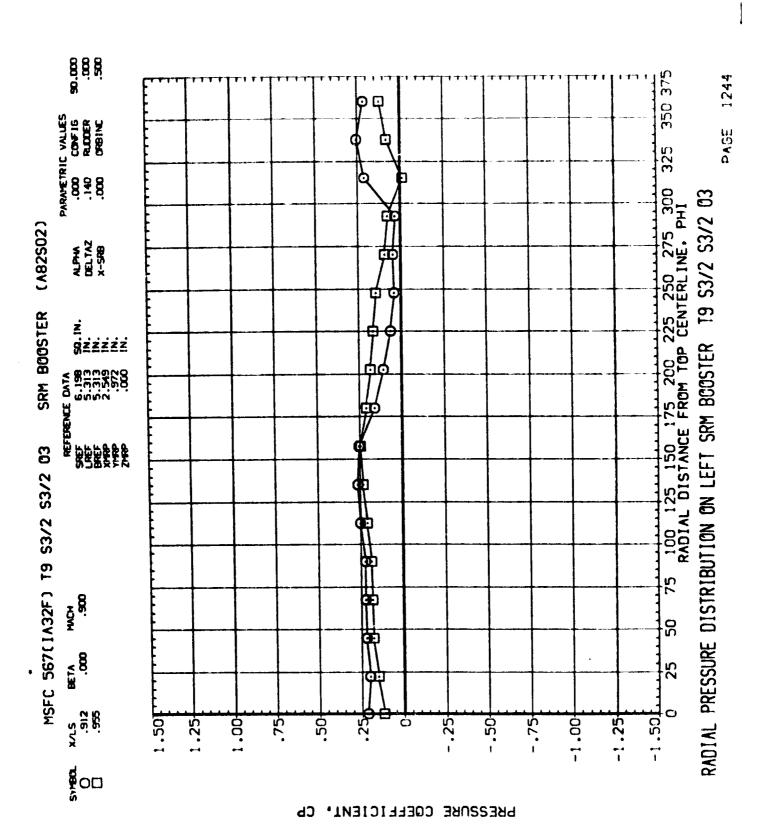
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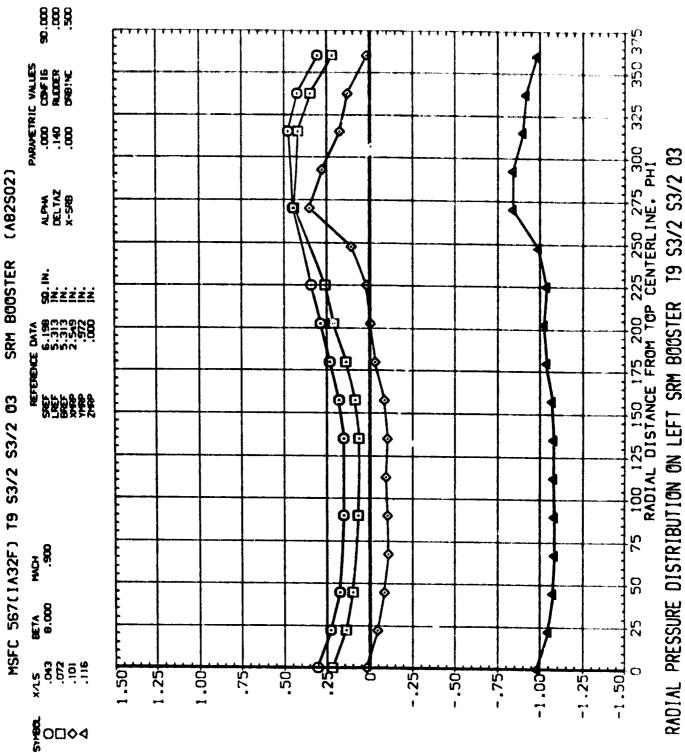


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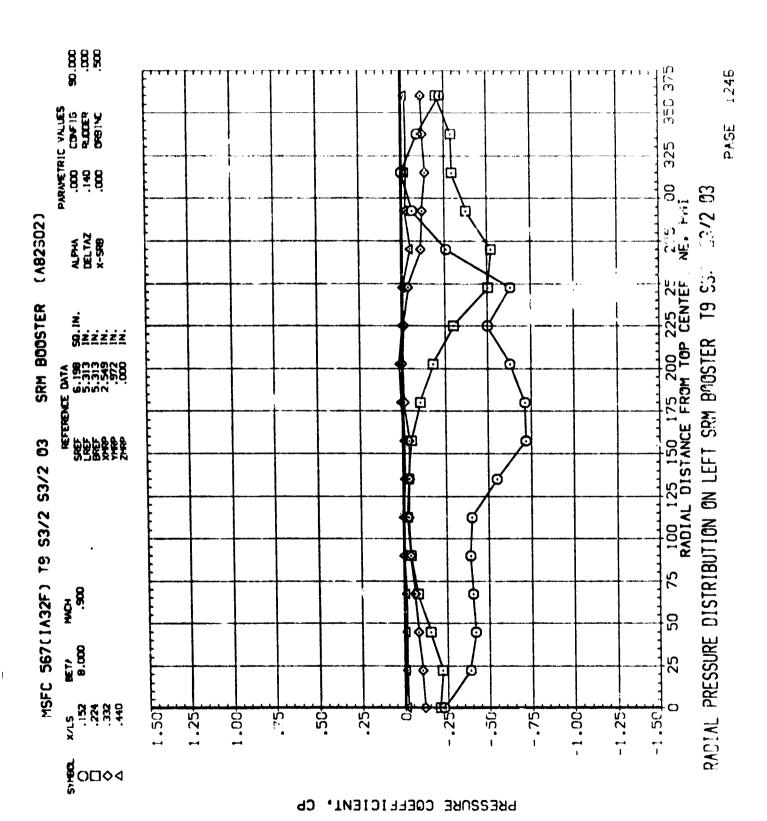
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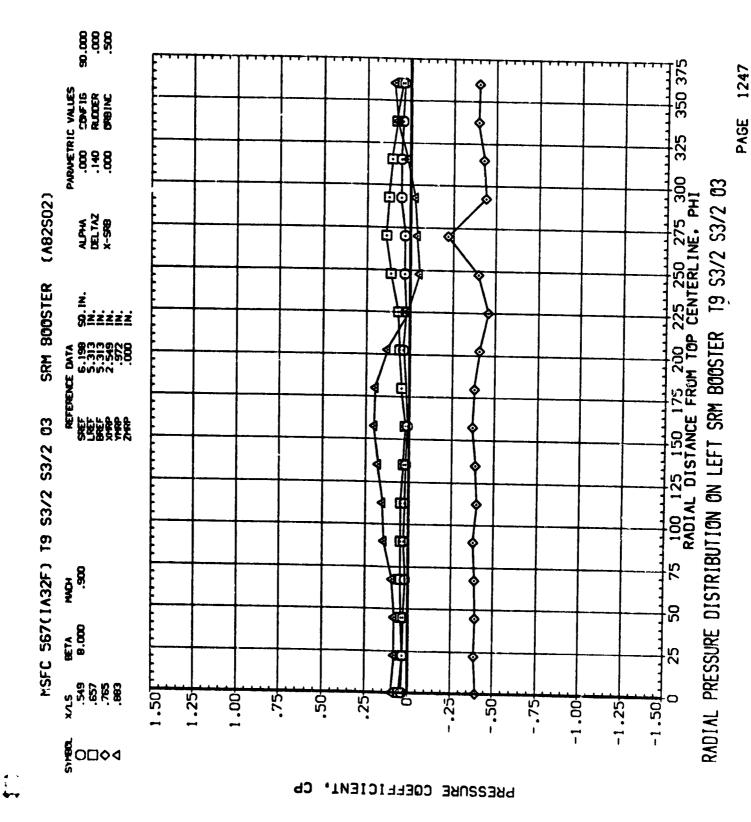


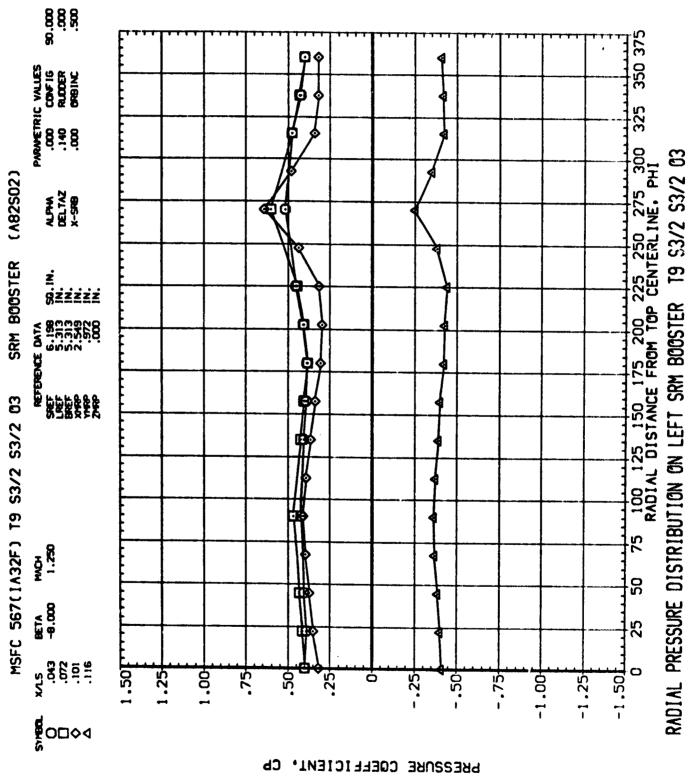
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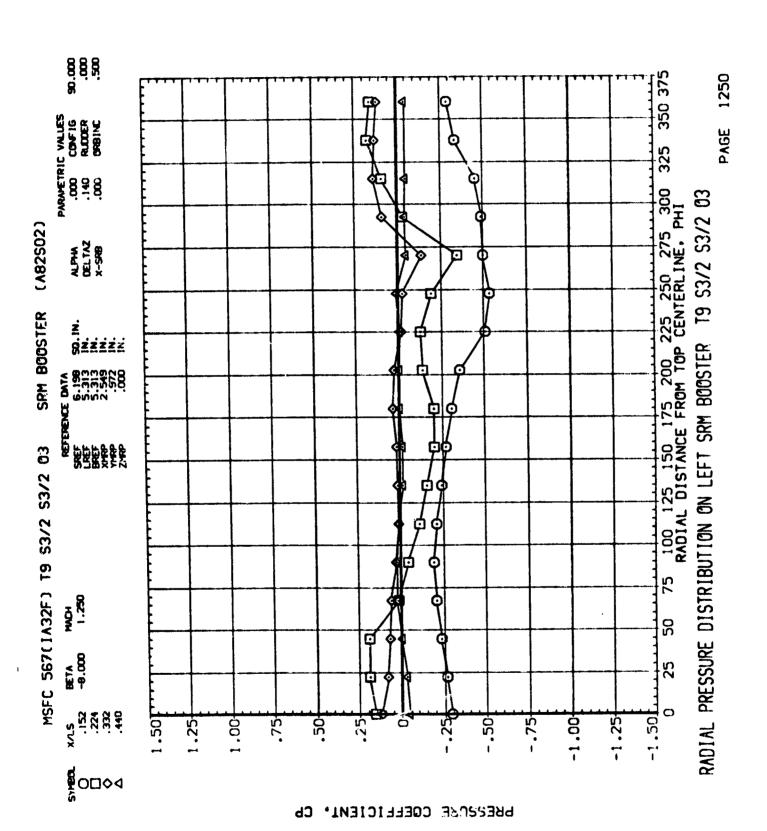


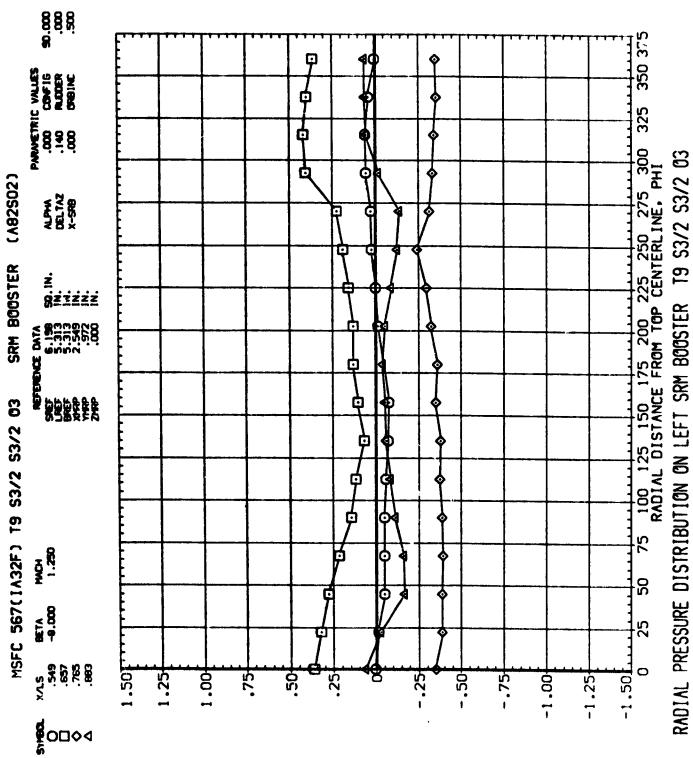
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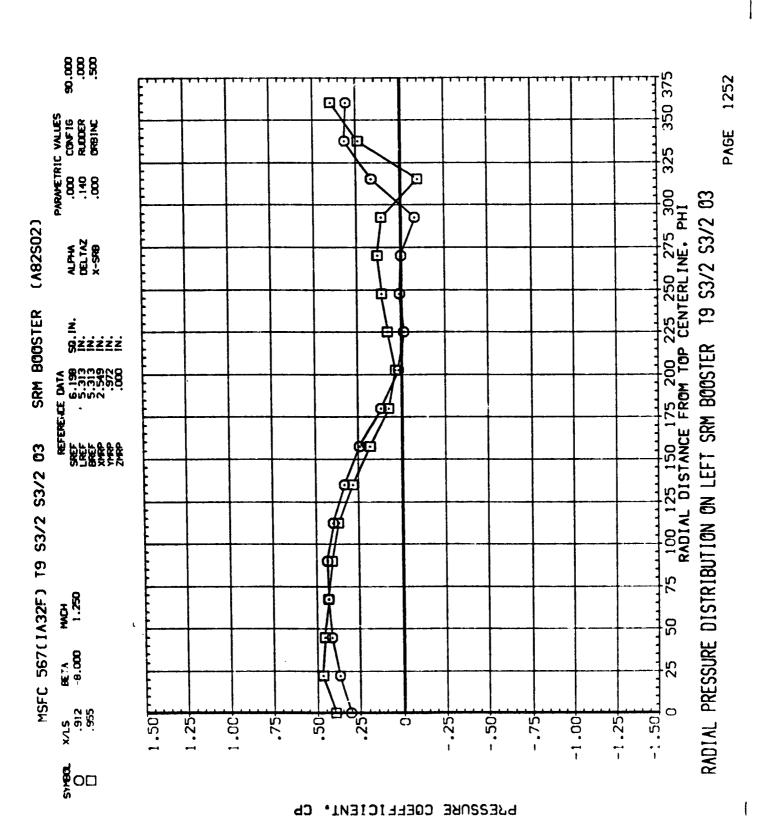


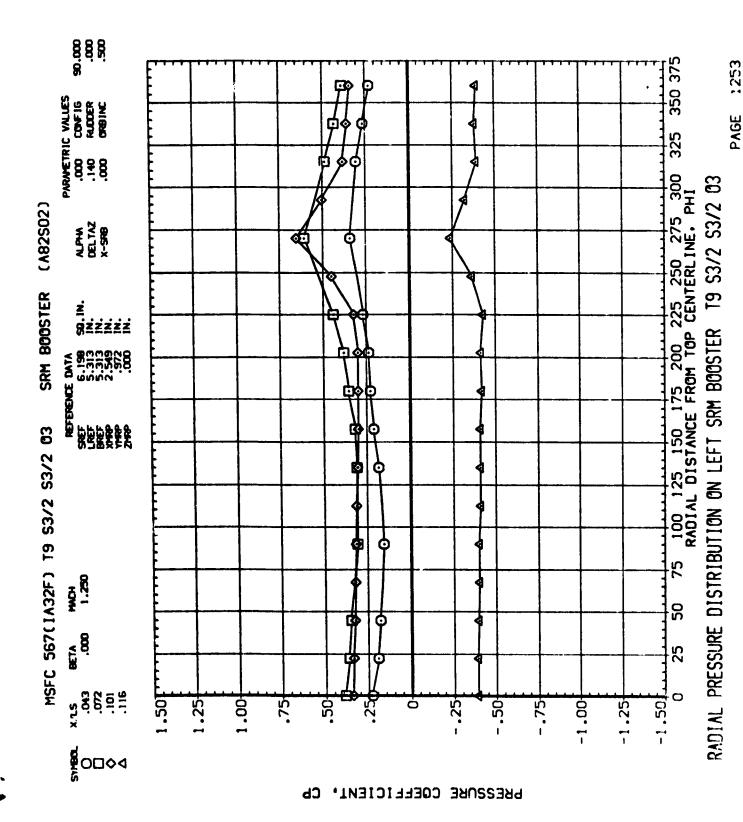
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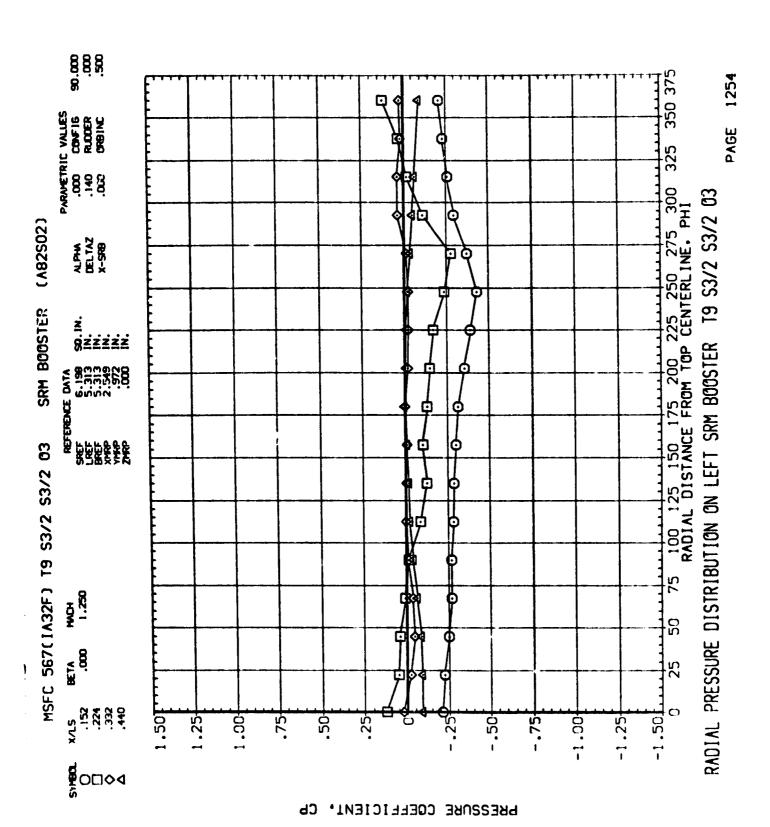


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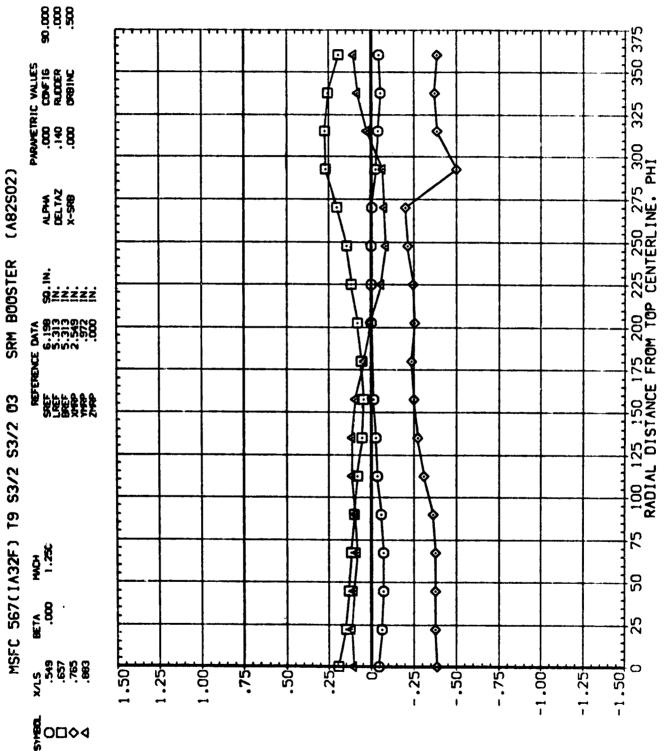




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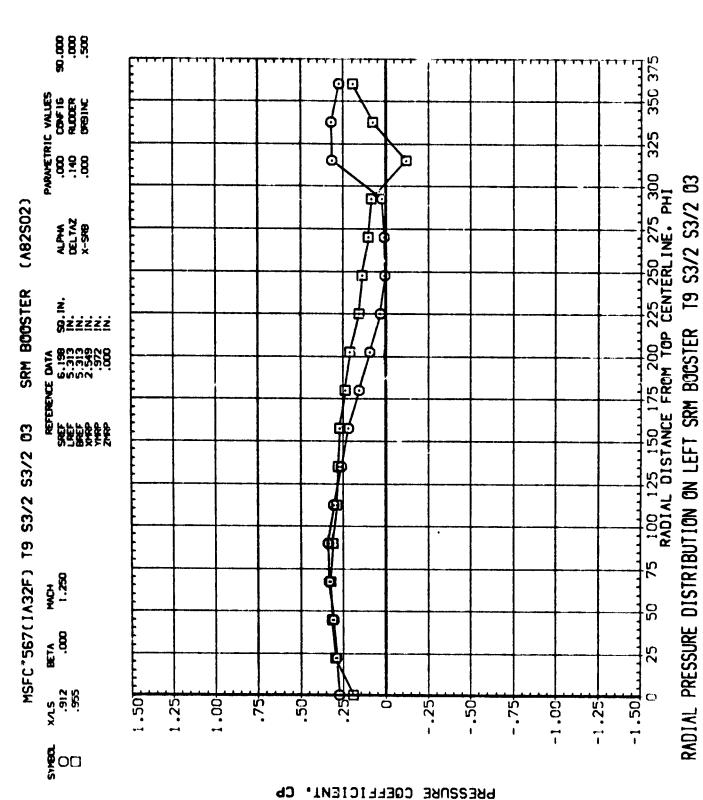


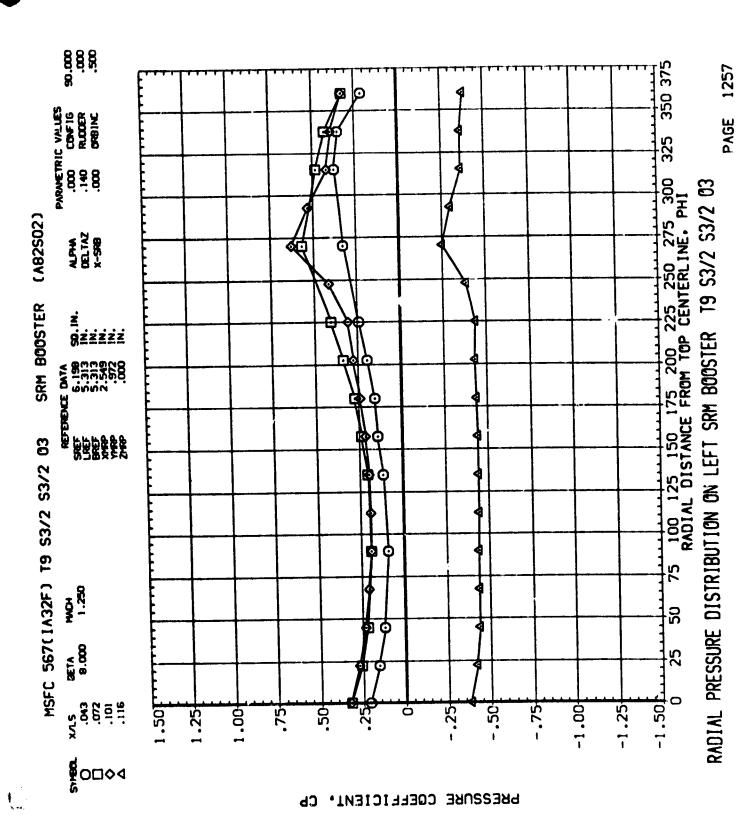
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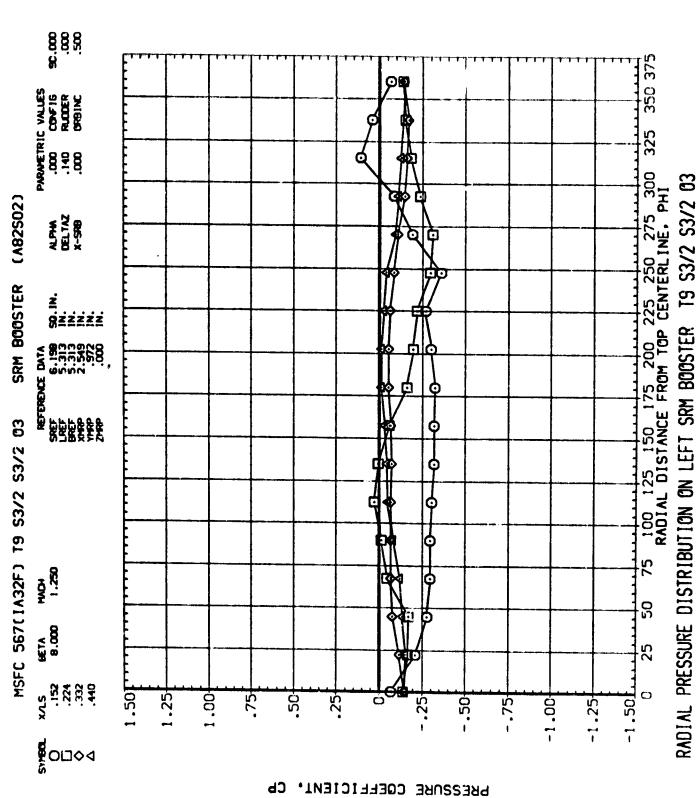


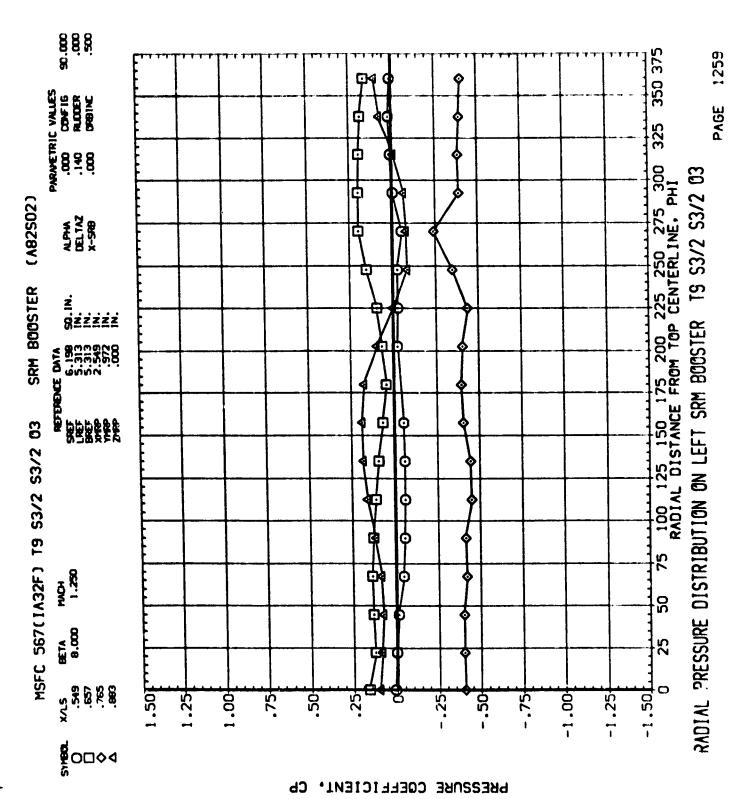
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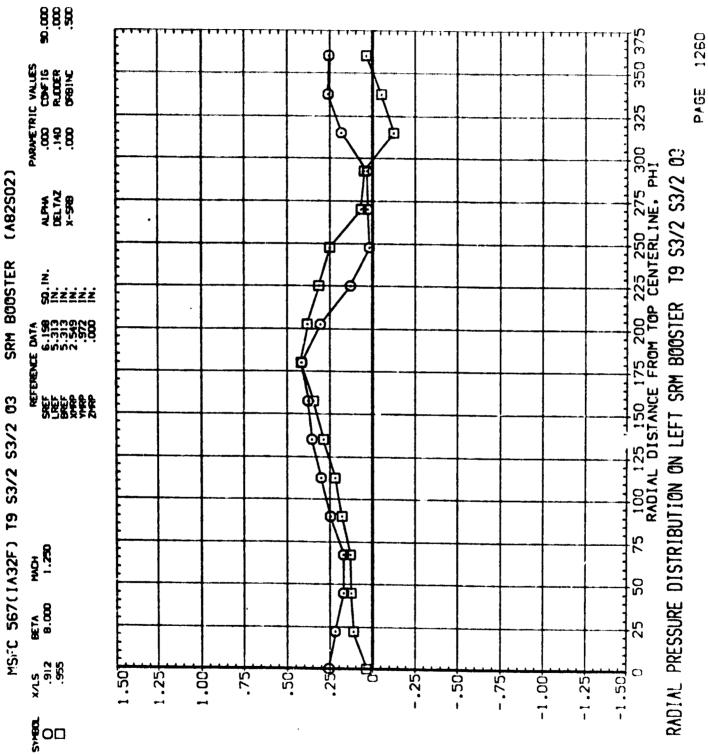
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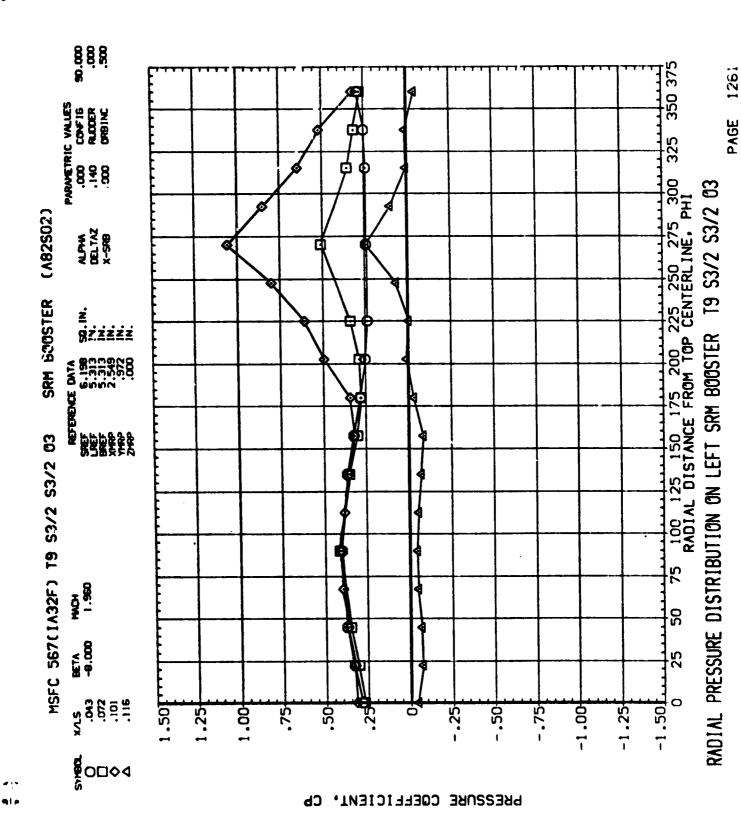


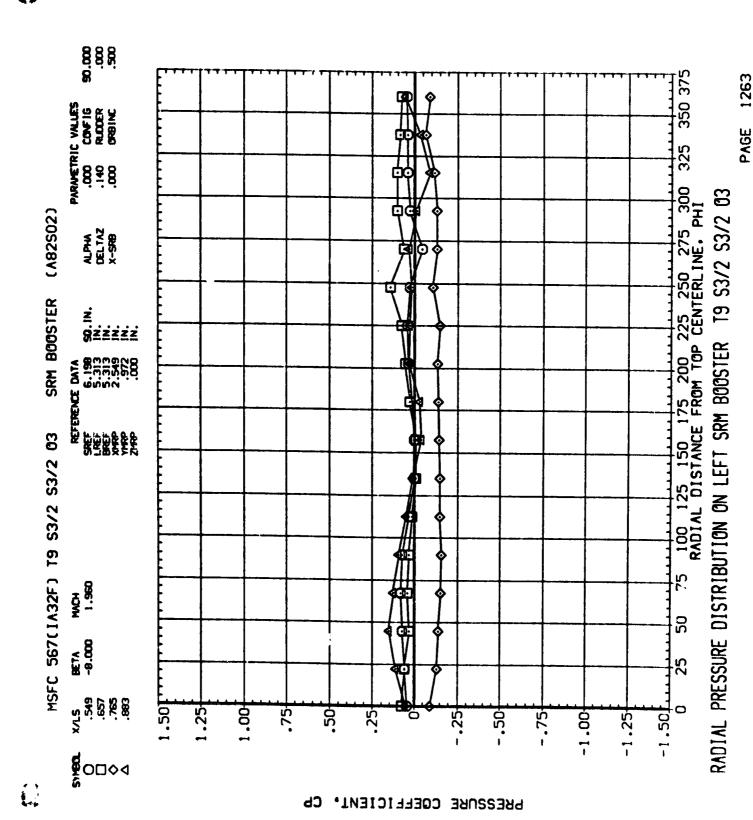


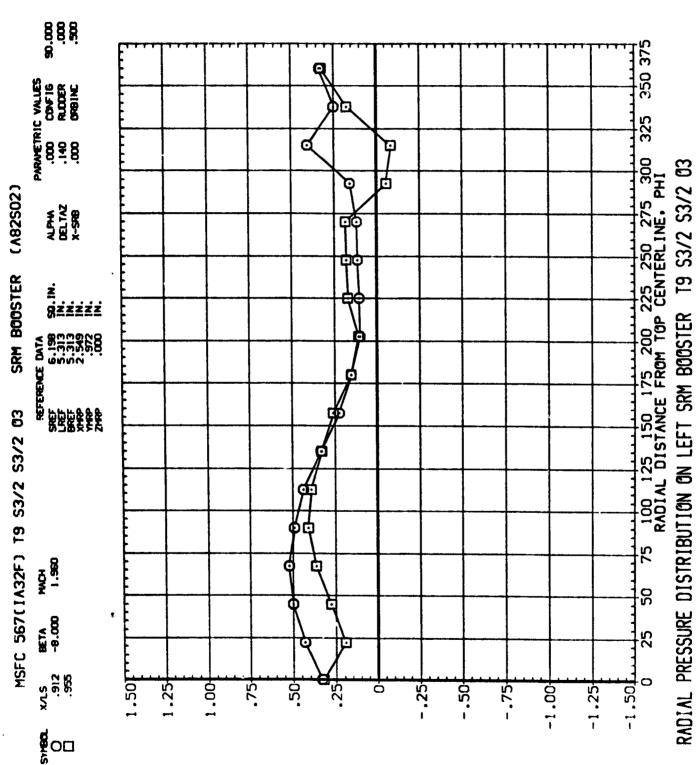




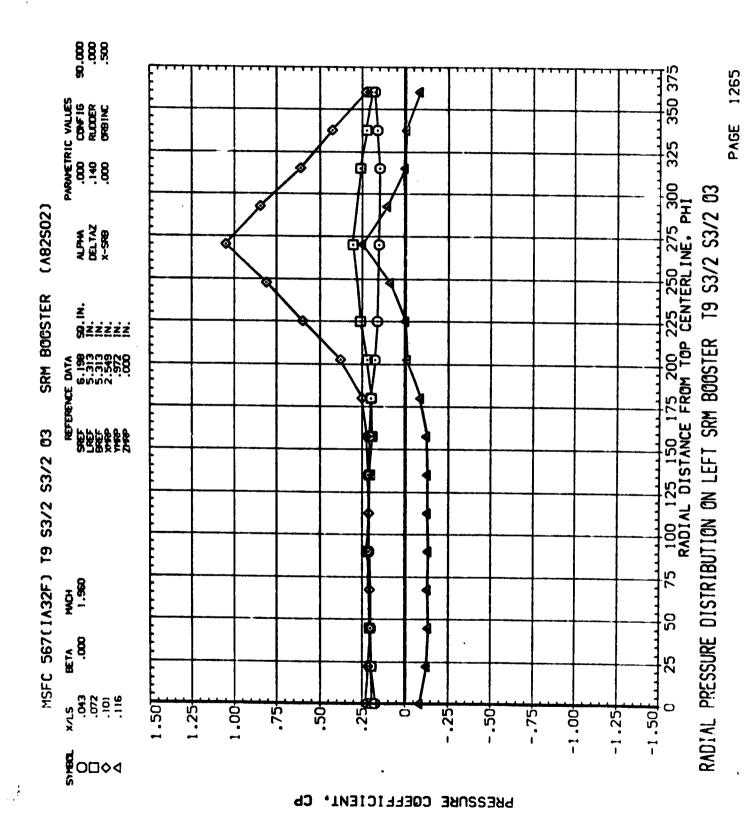
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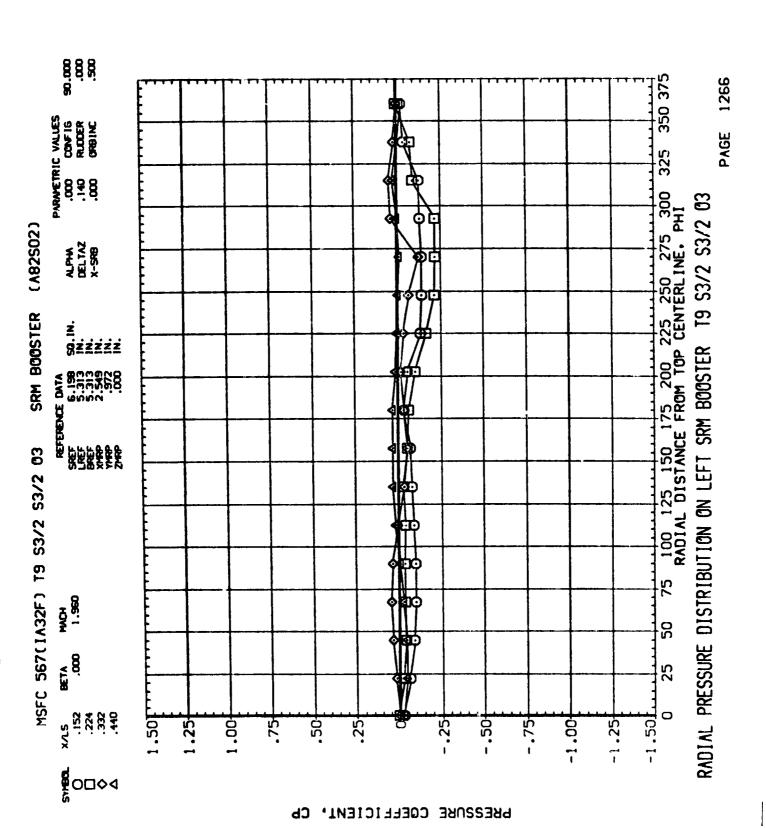


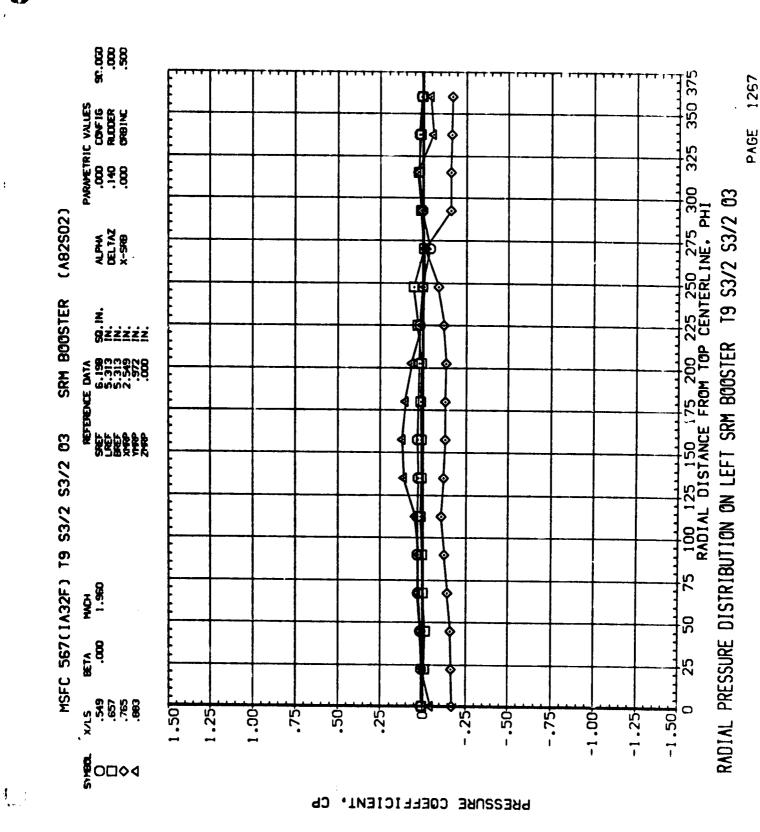


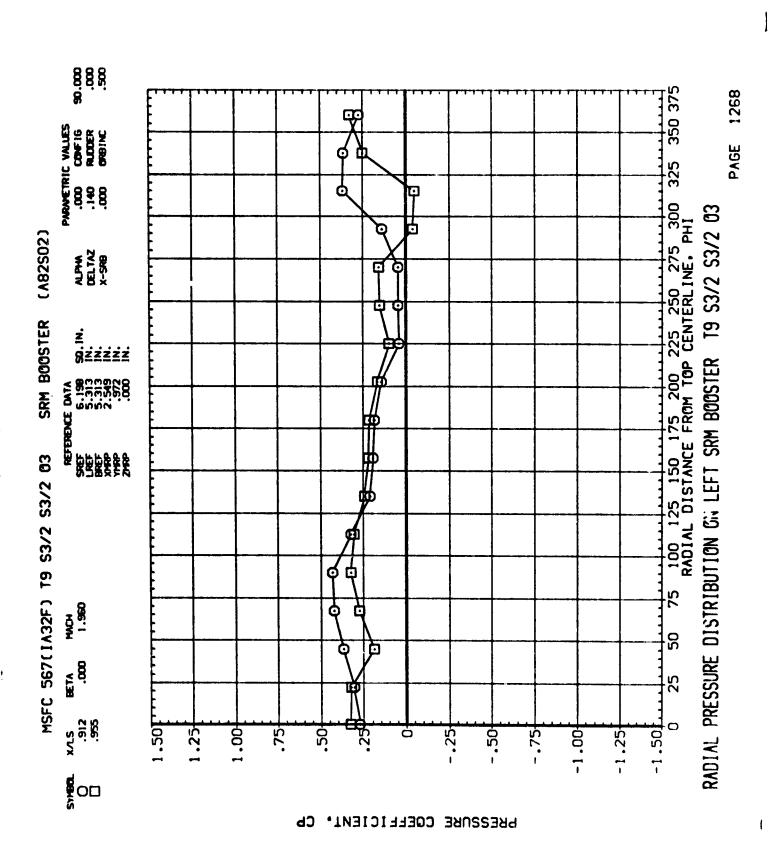


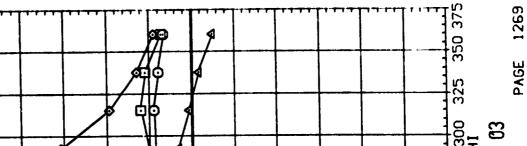
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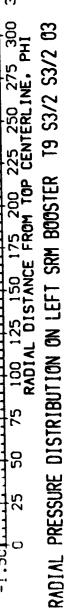












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.140 RADDER
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ALPHA DELTAZ X-SRB

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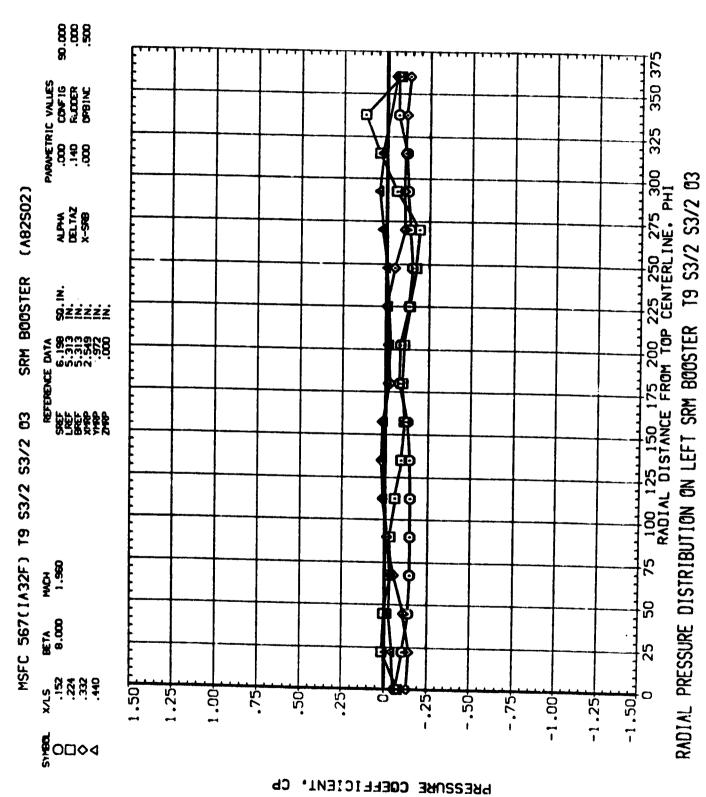
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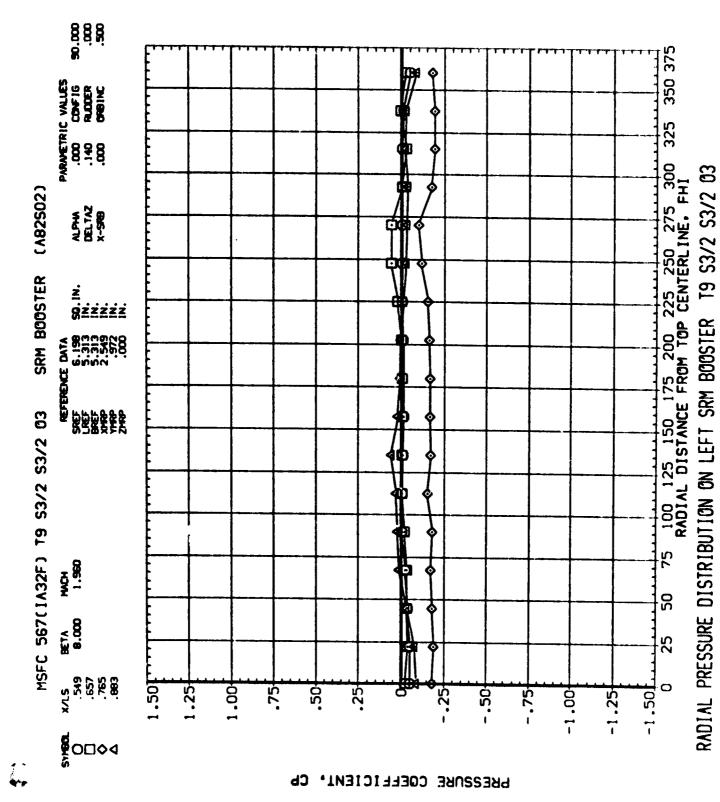
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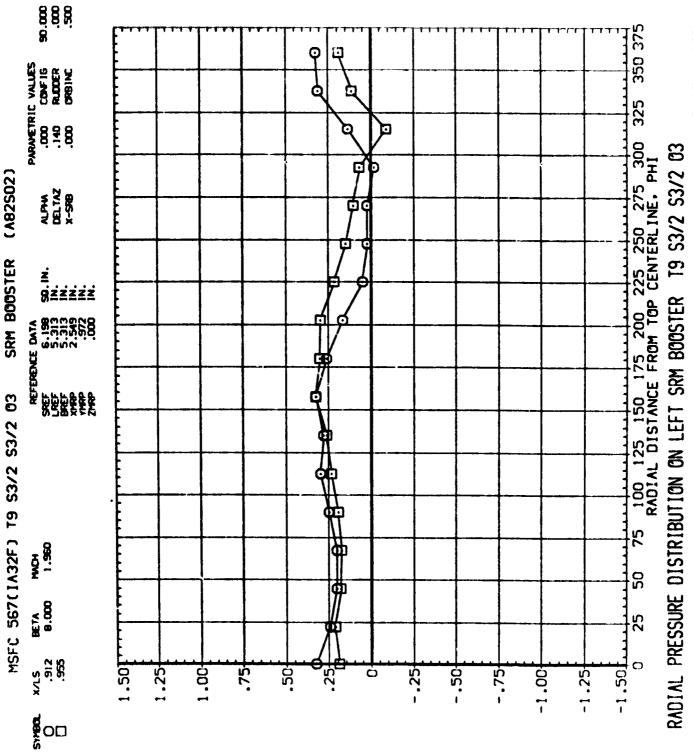
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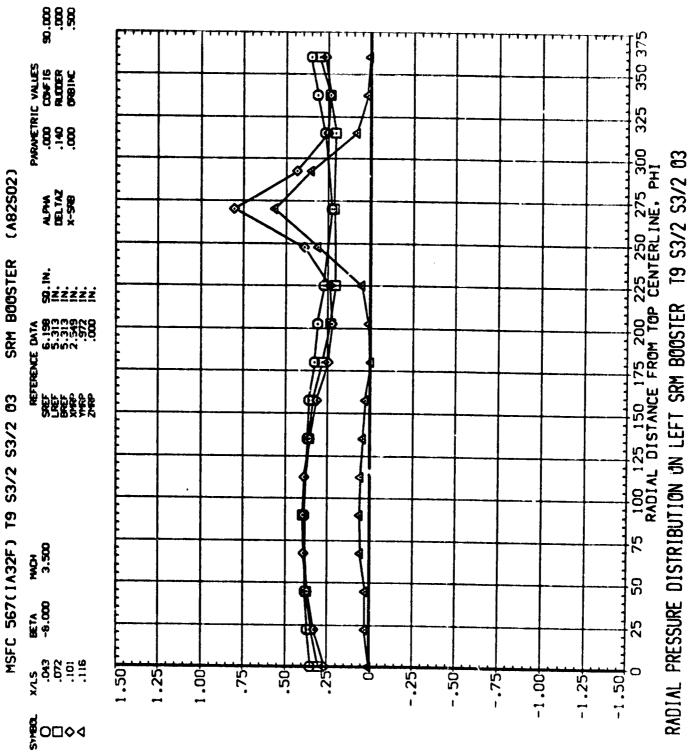
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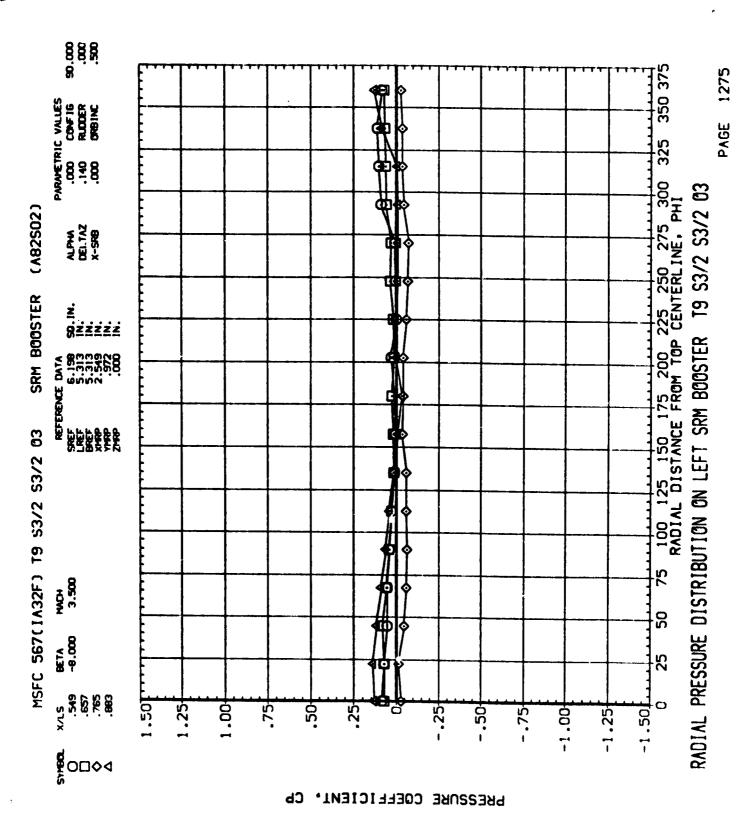


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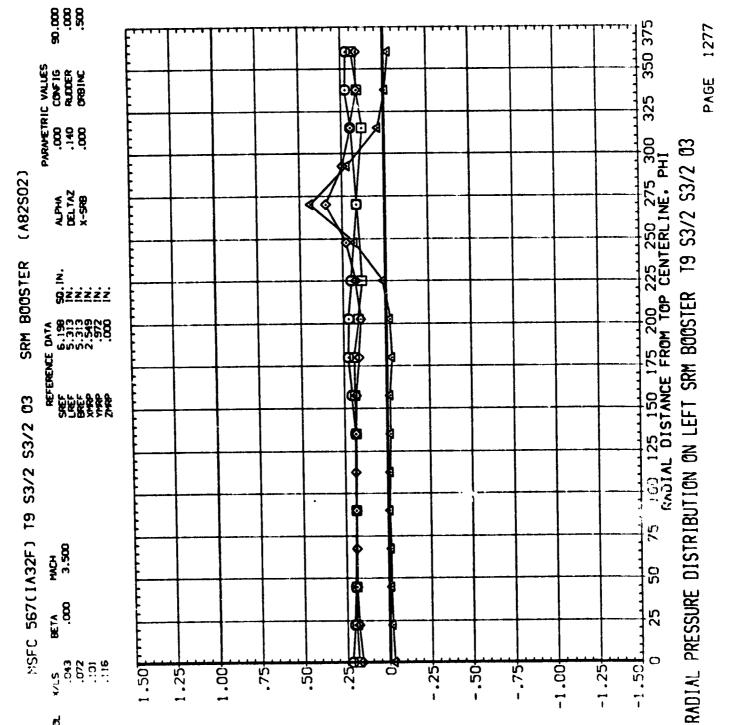


PRESSURE COEFFICIENT, CP

PAGE 1274

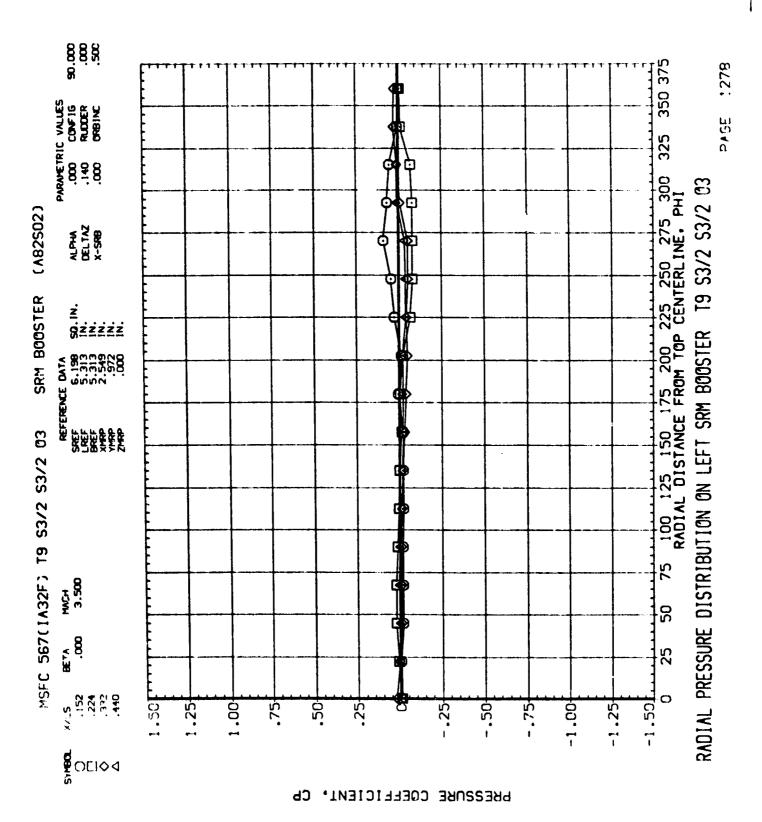


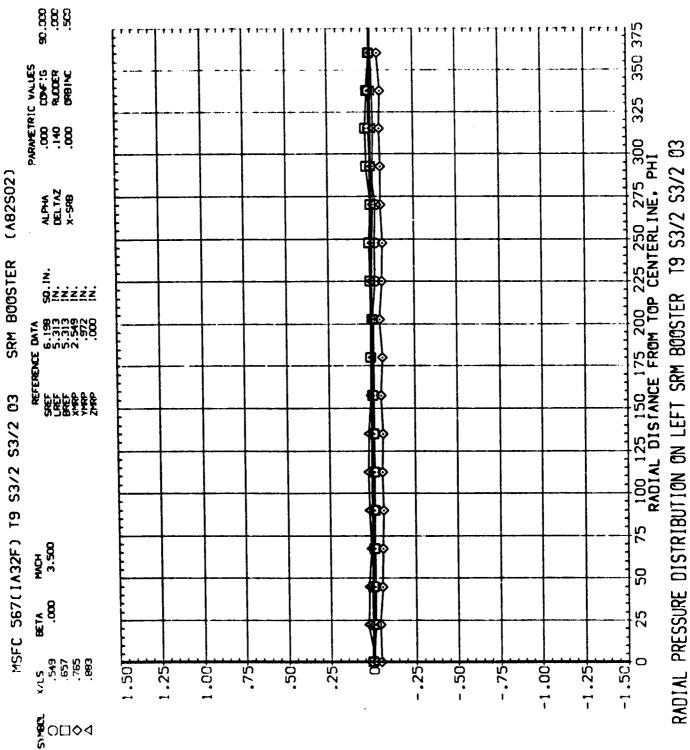
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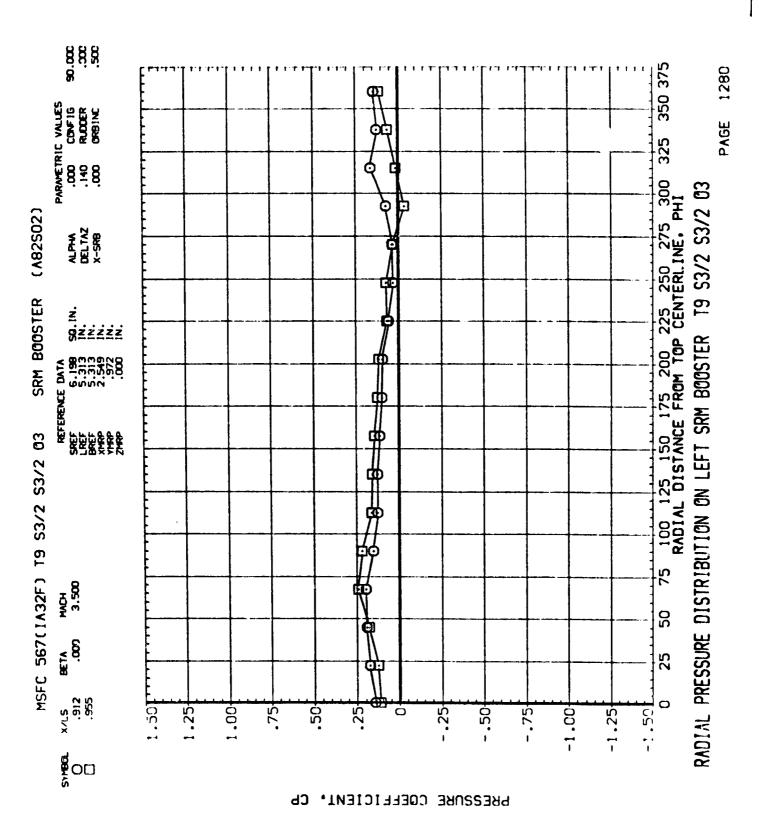
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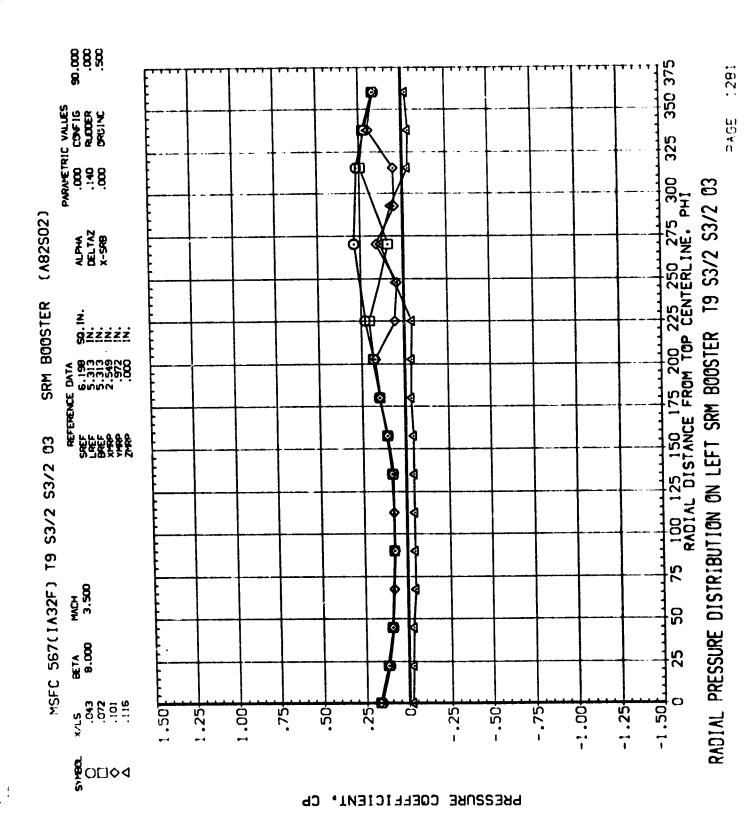


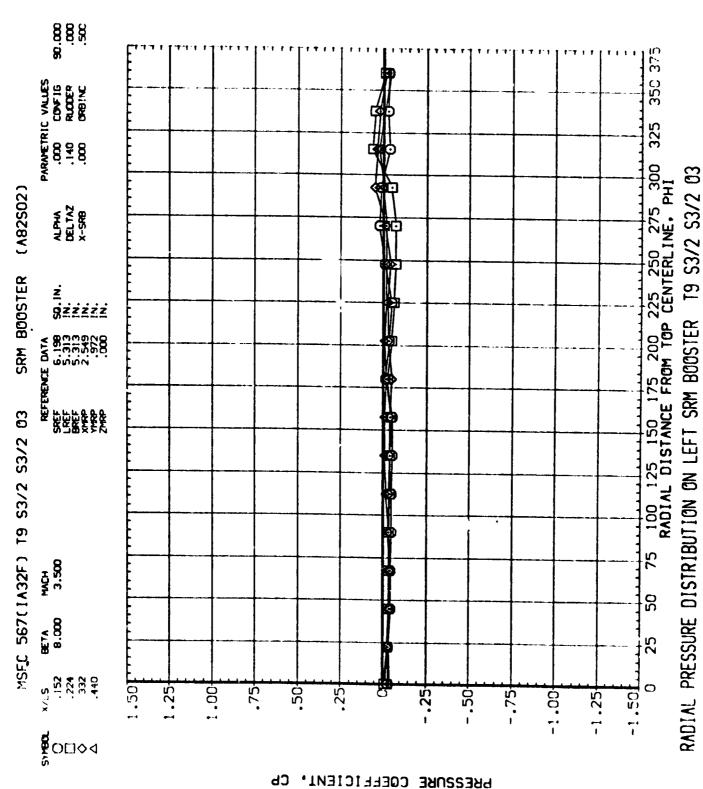


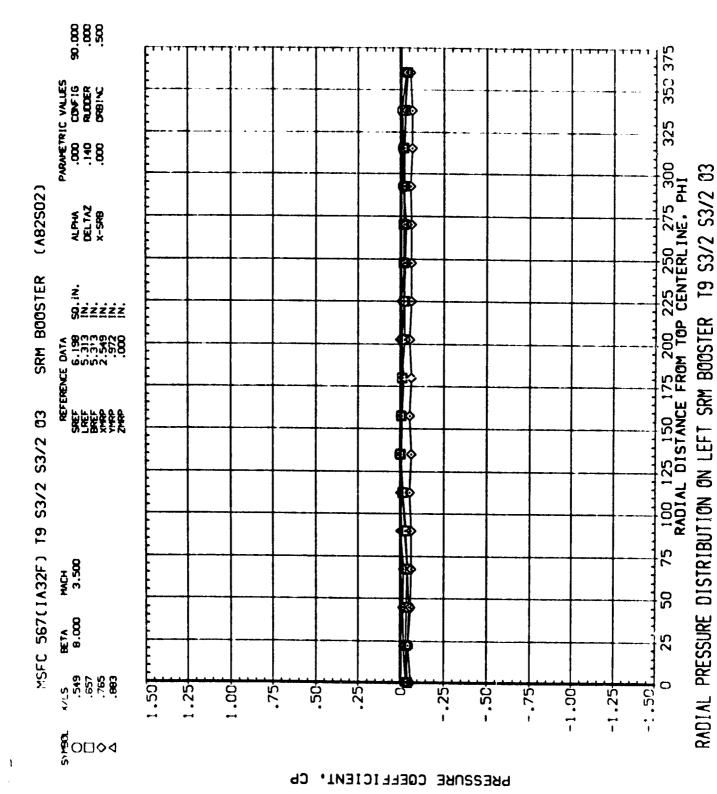
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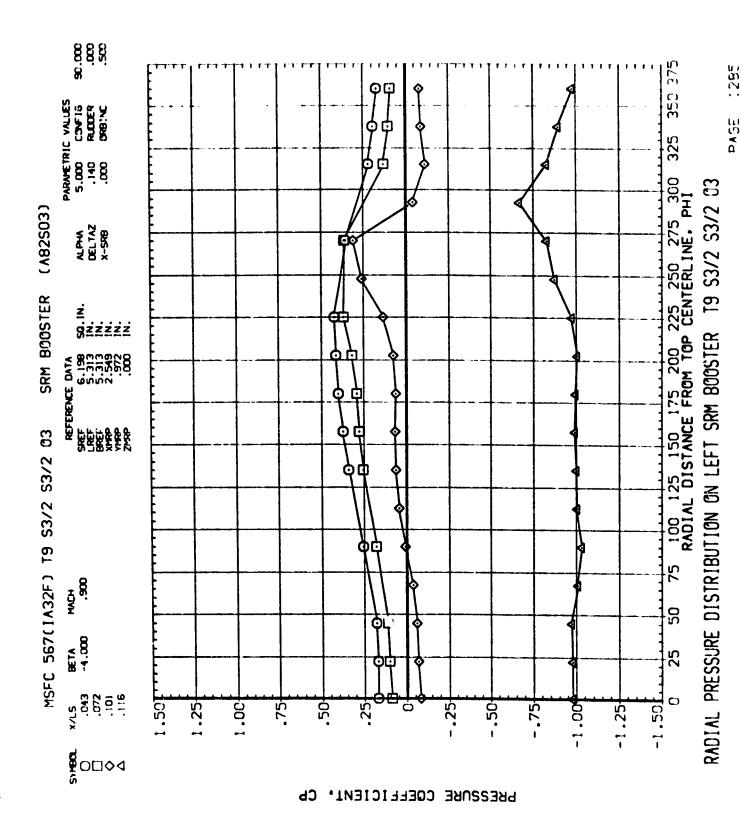


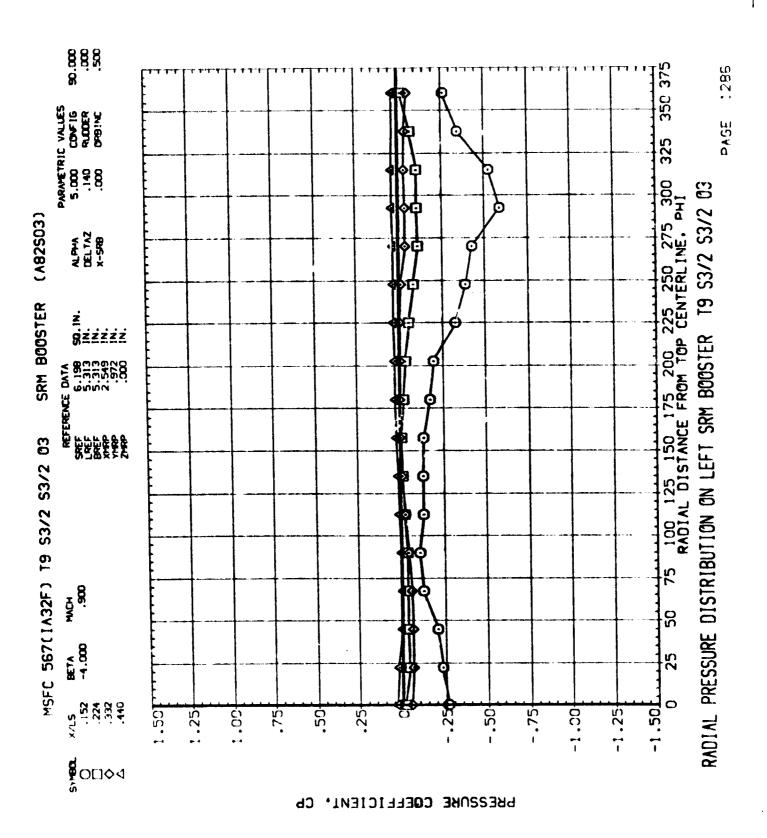


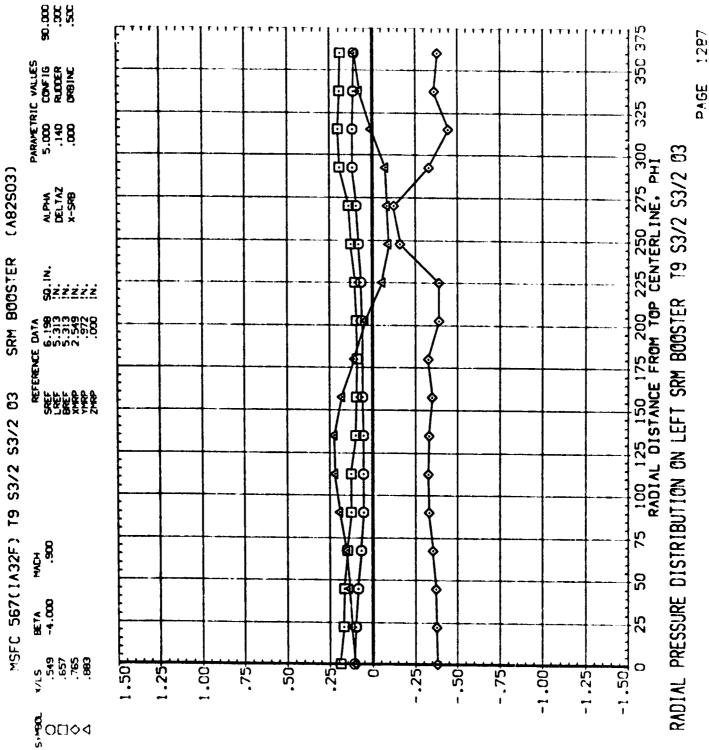




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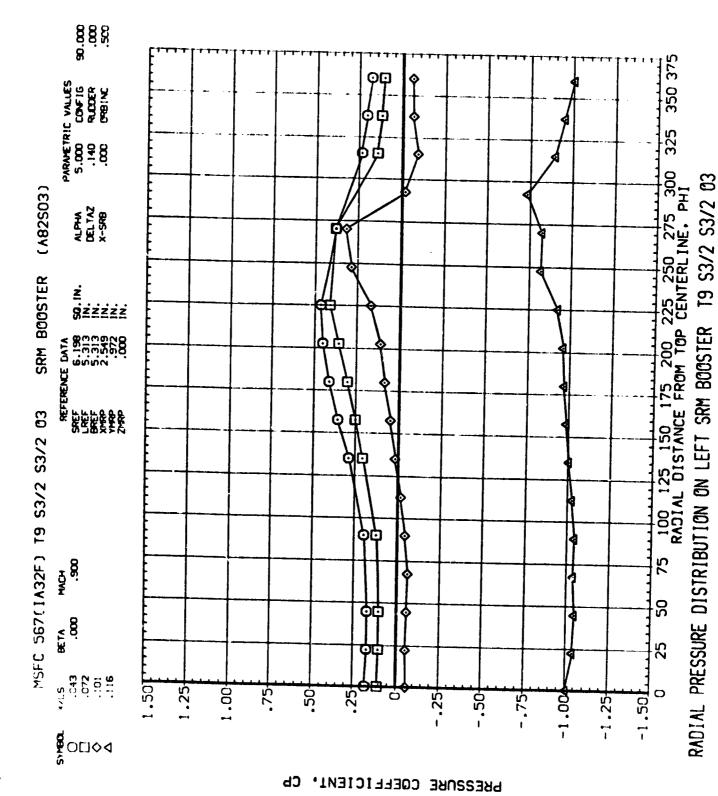
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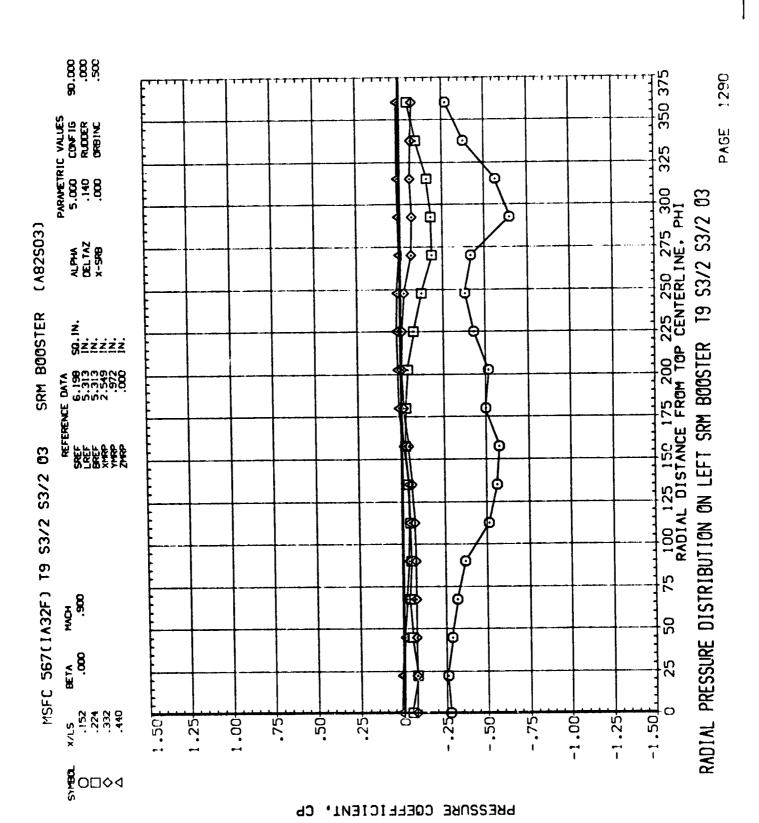
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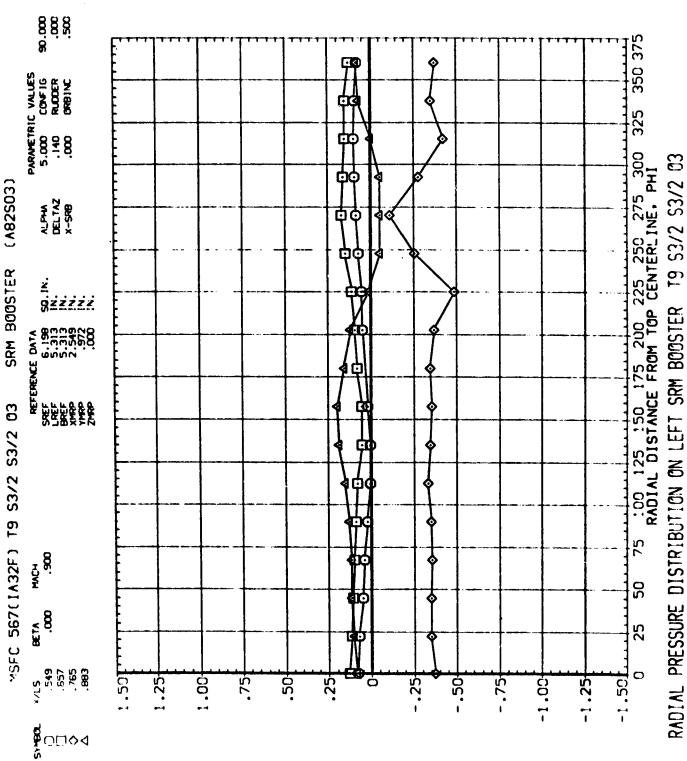
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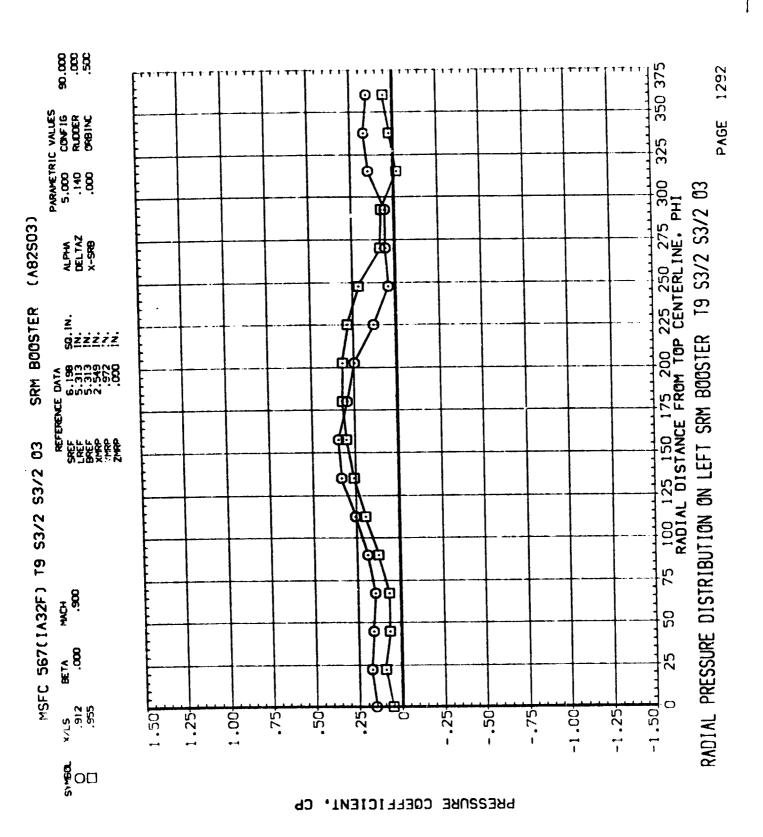
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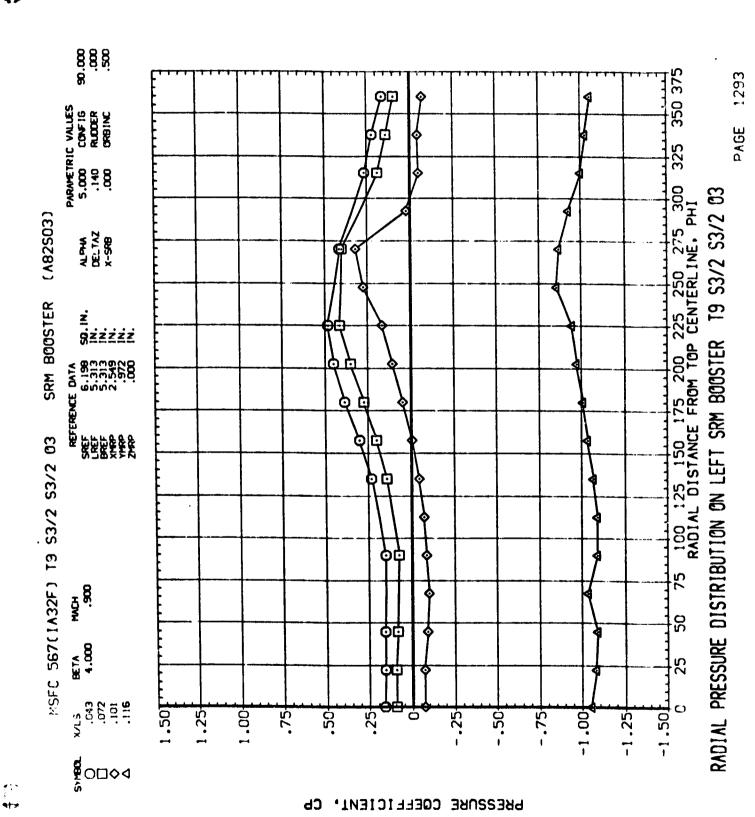


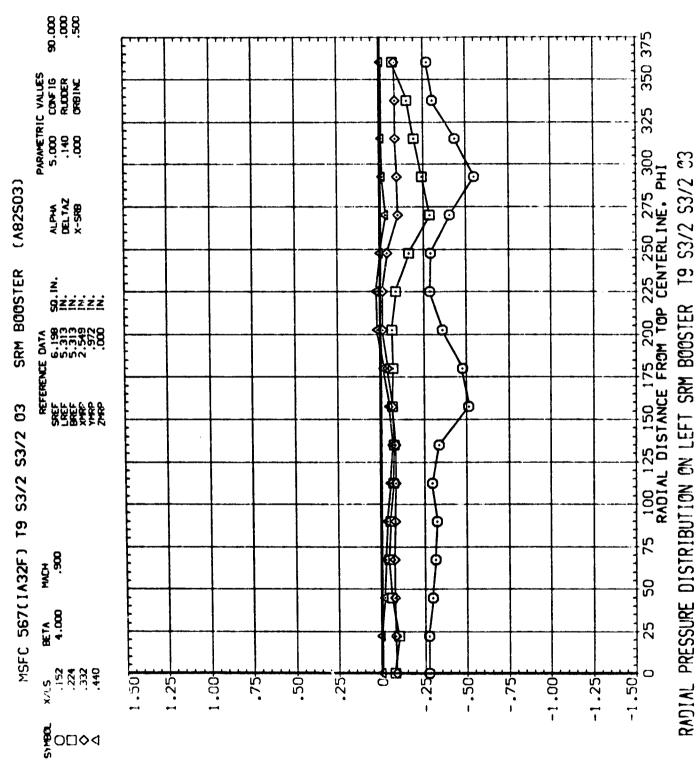




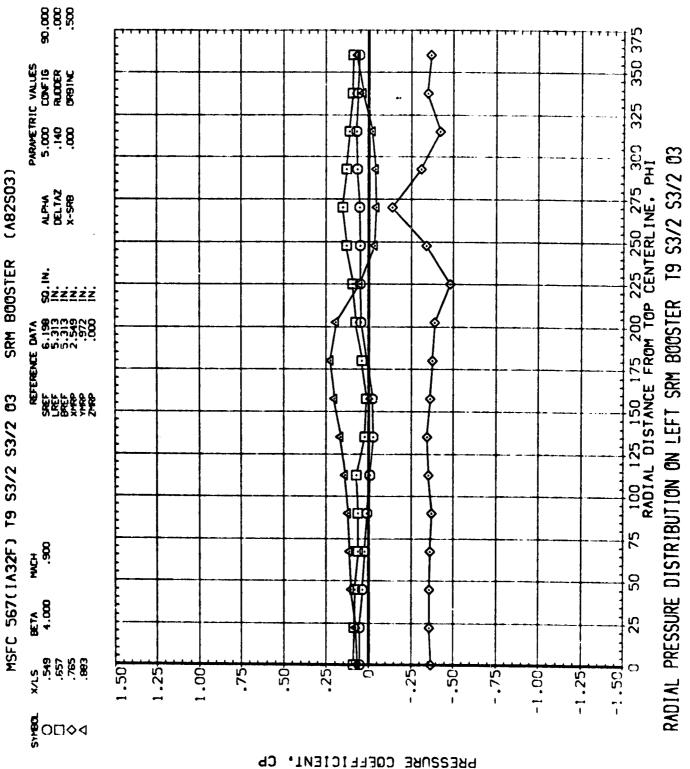
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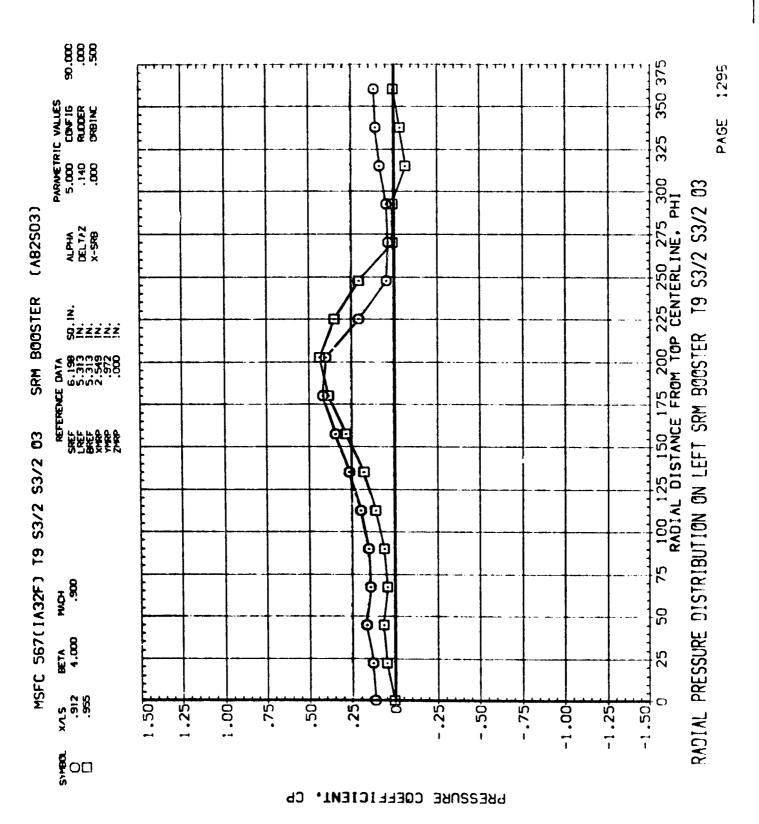


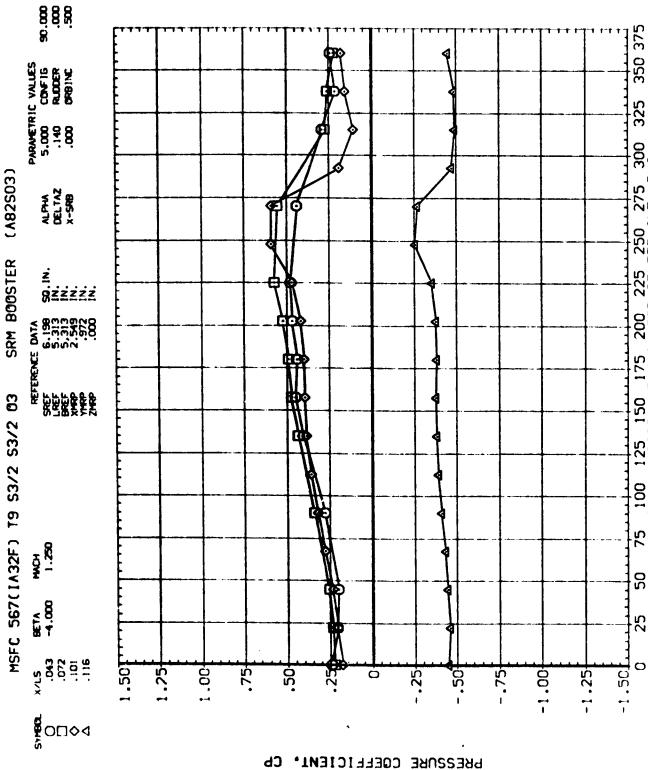


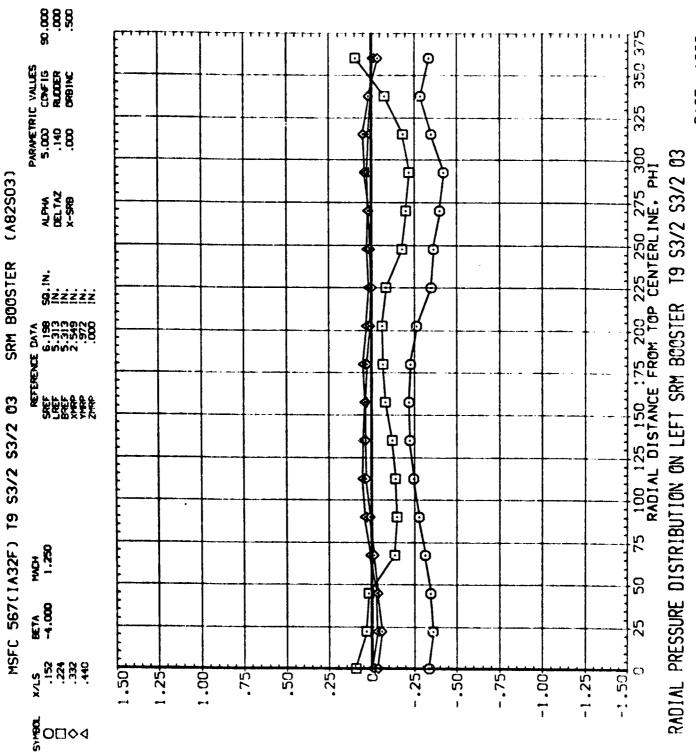


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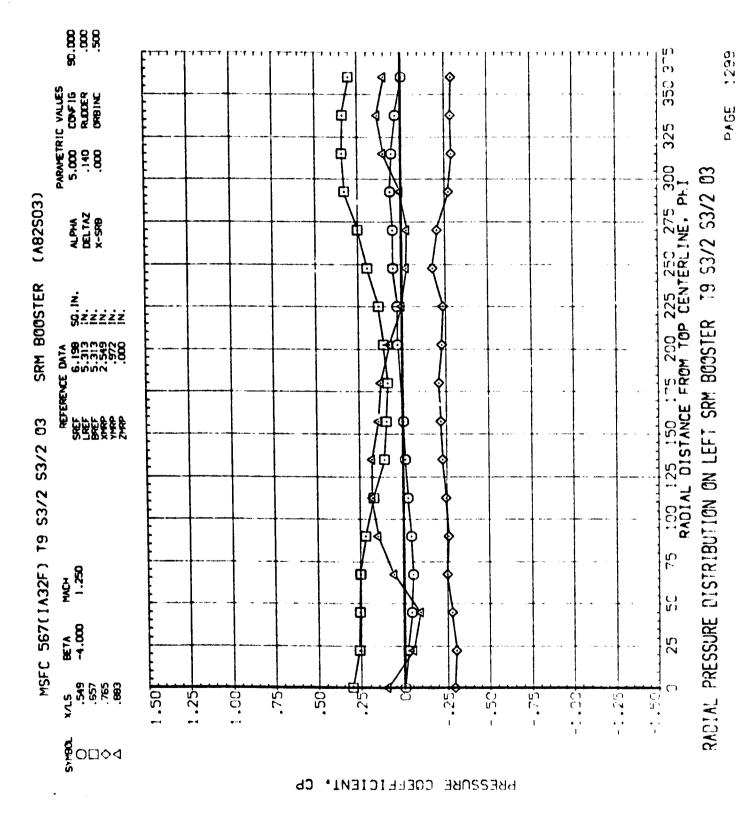




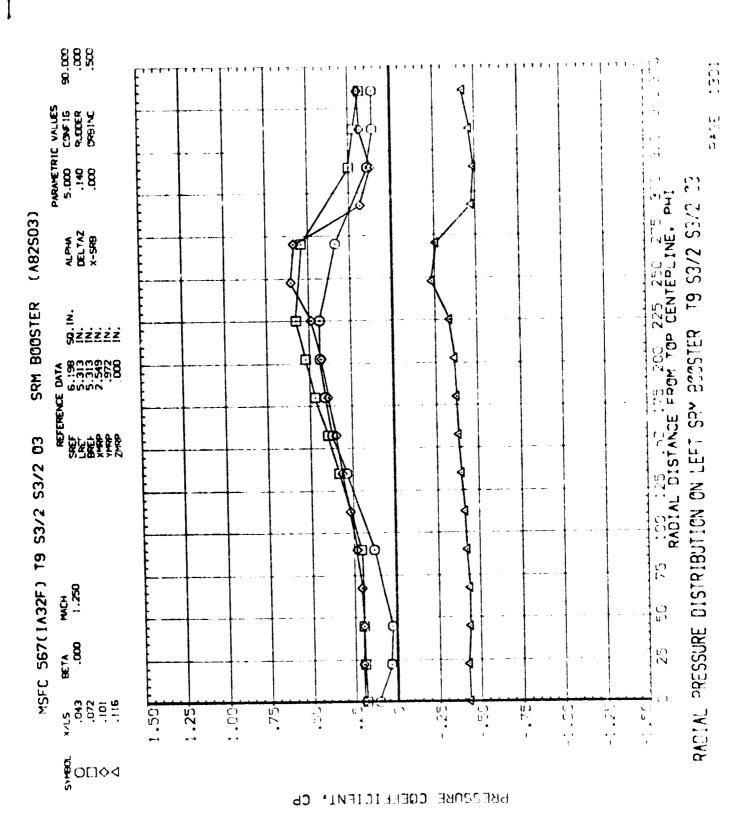


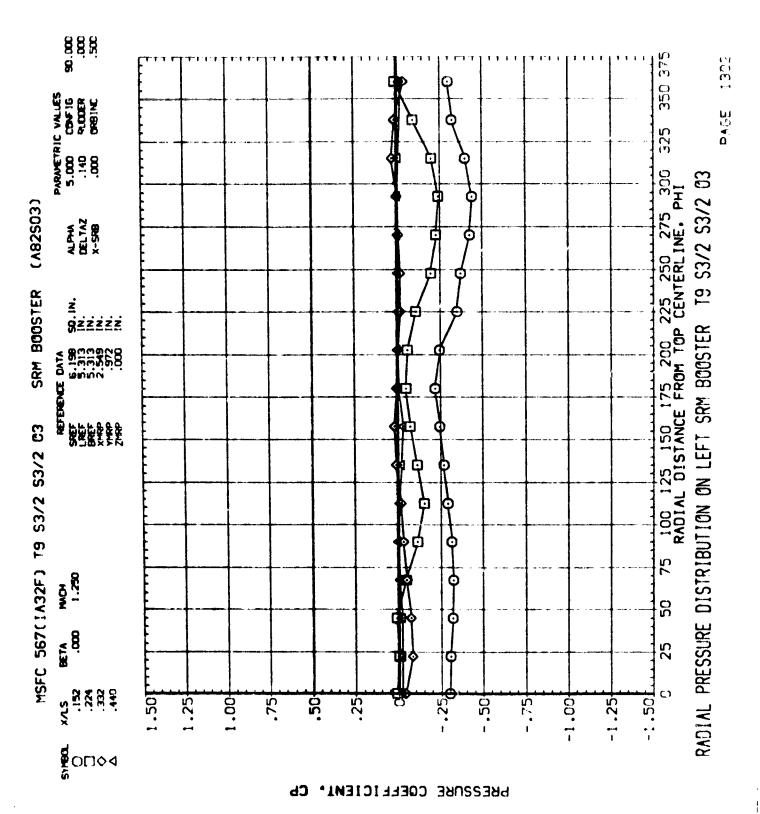


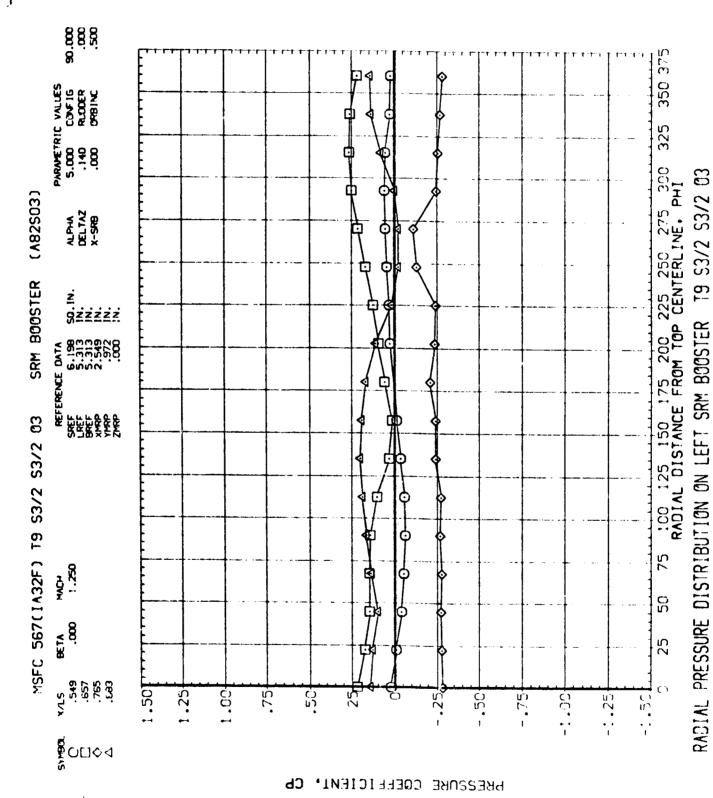
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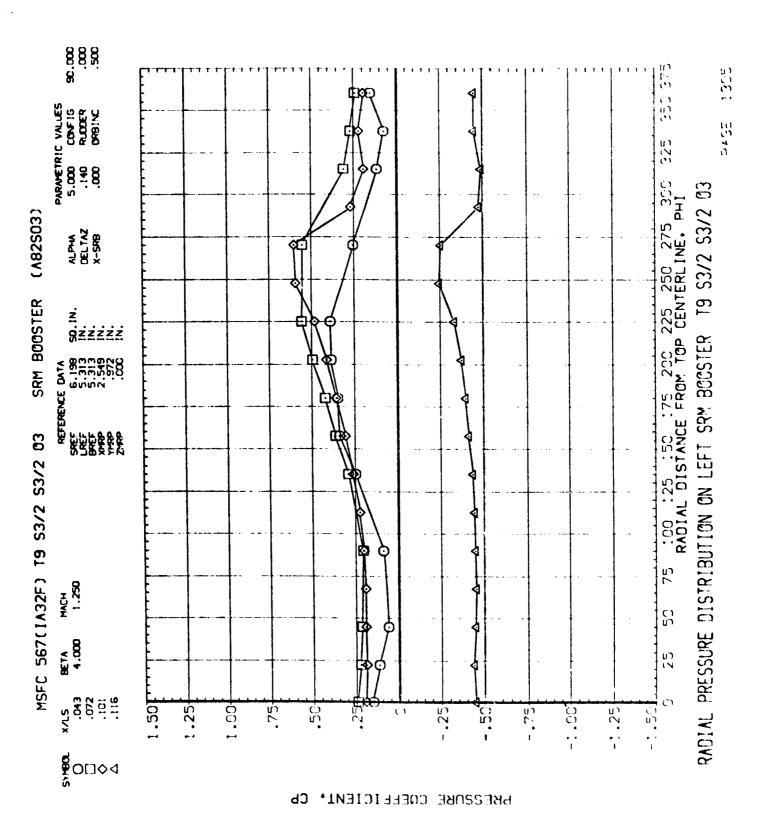
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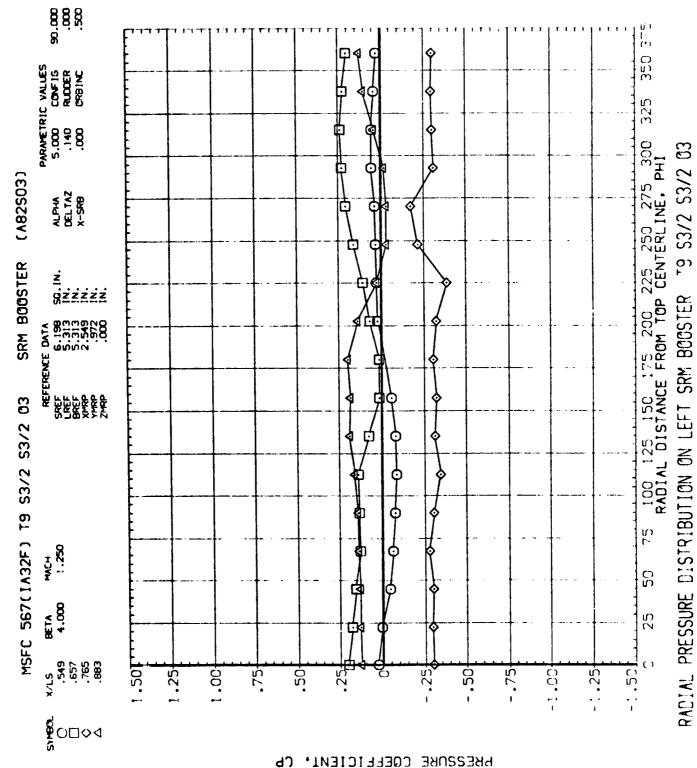


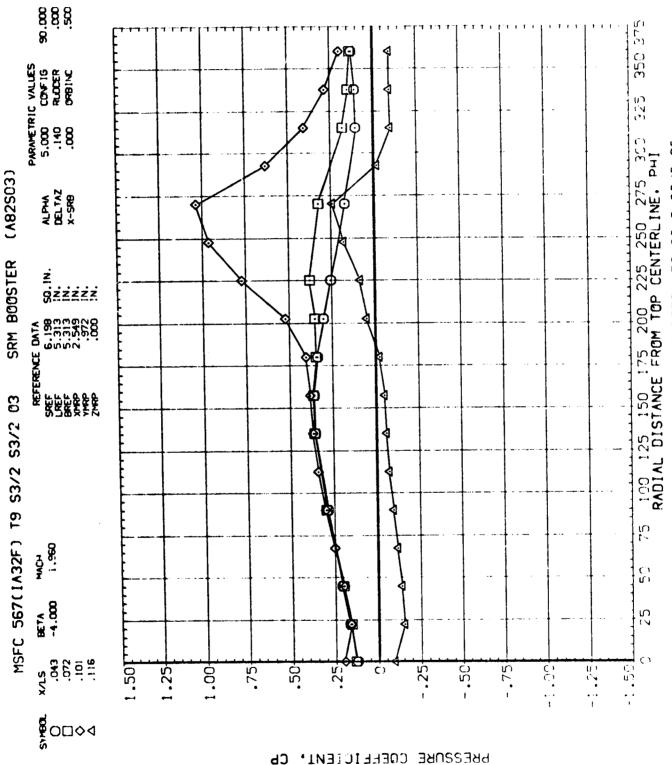
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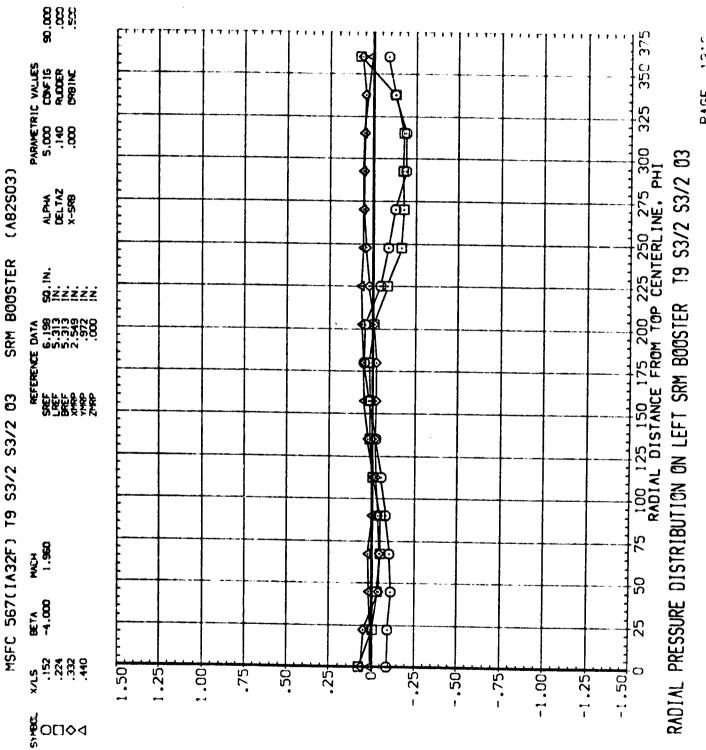
T9 S3/2 S3/2 03 RADIAL PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER



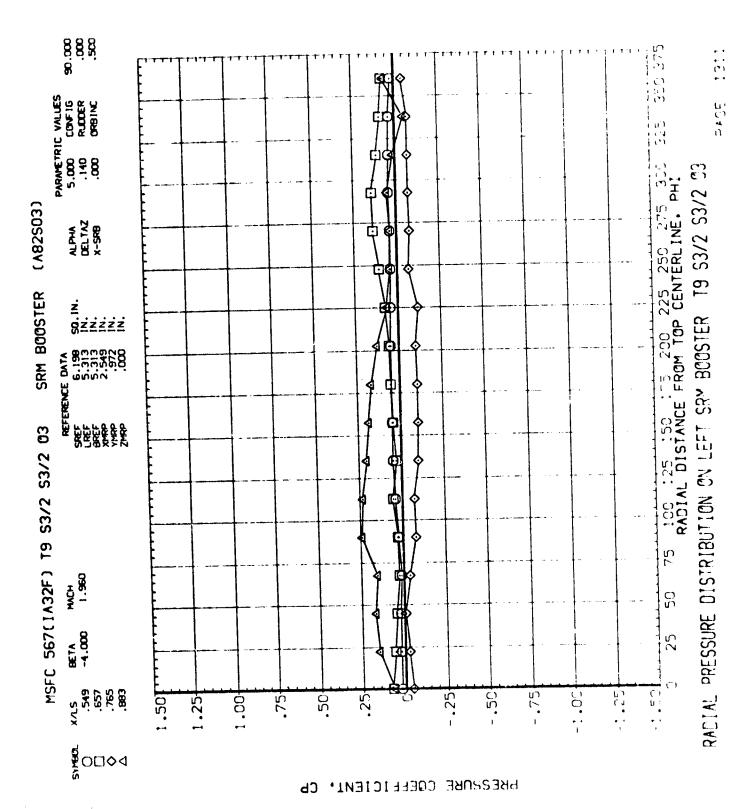


19 53/2 53/2 63 RADIAL PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER

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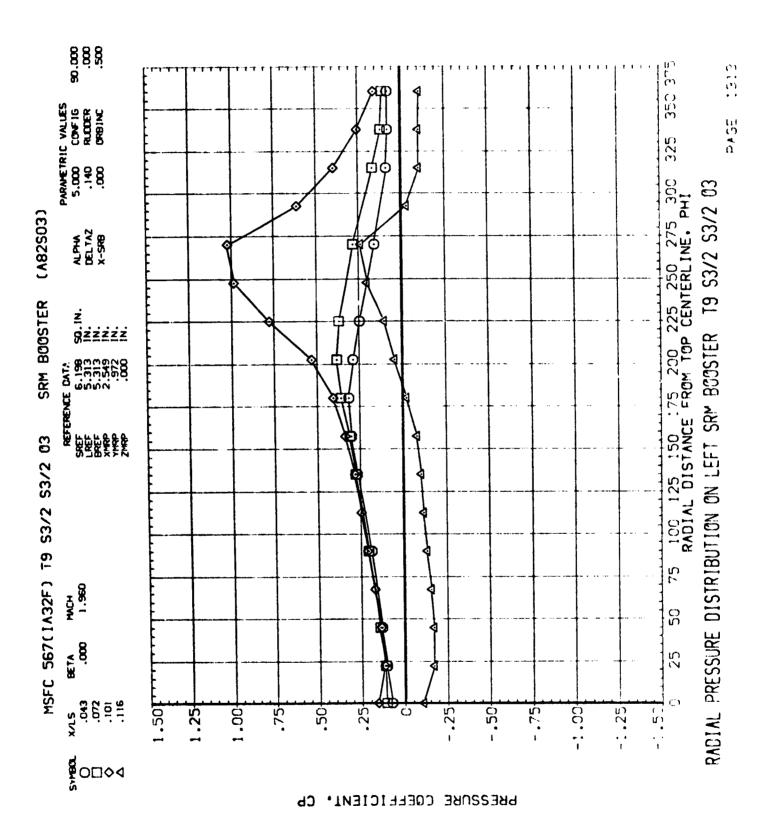


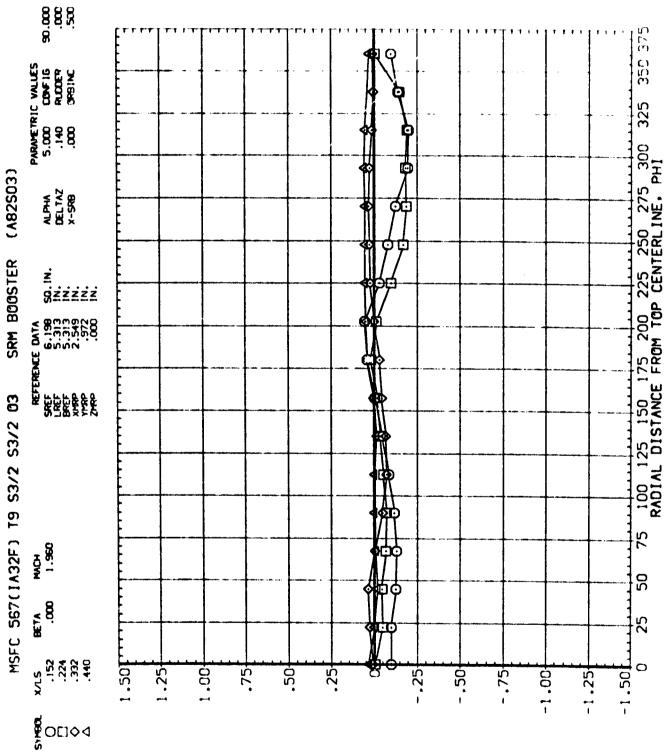
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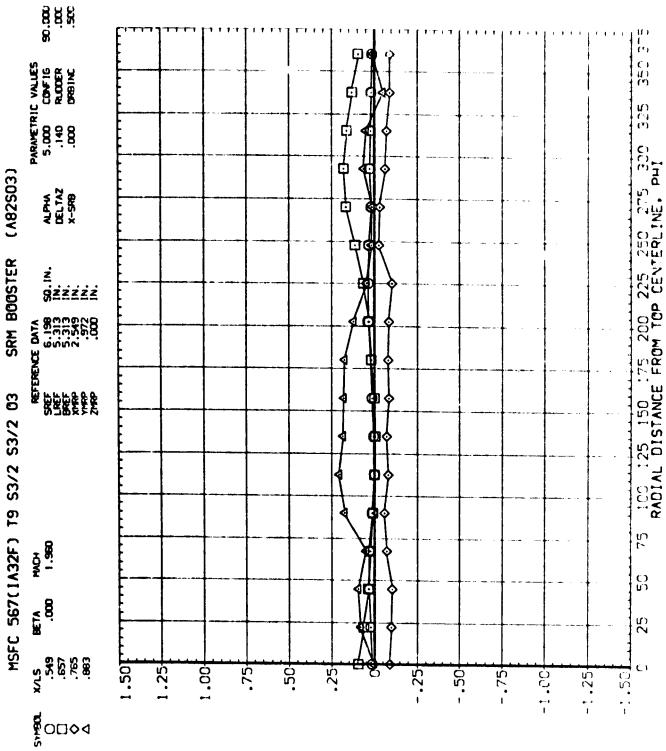
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RADIAL PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER 19 S3/2 S3/2 03



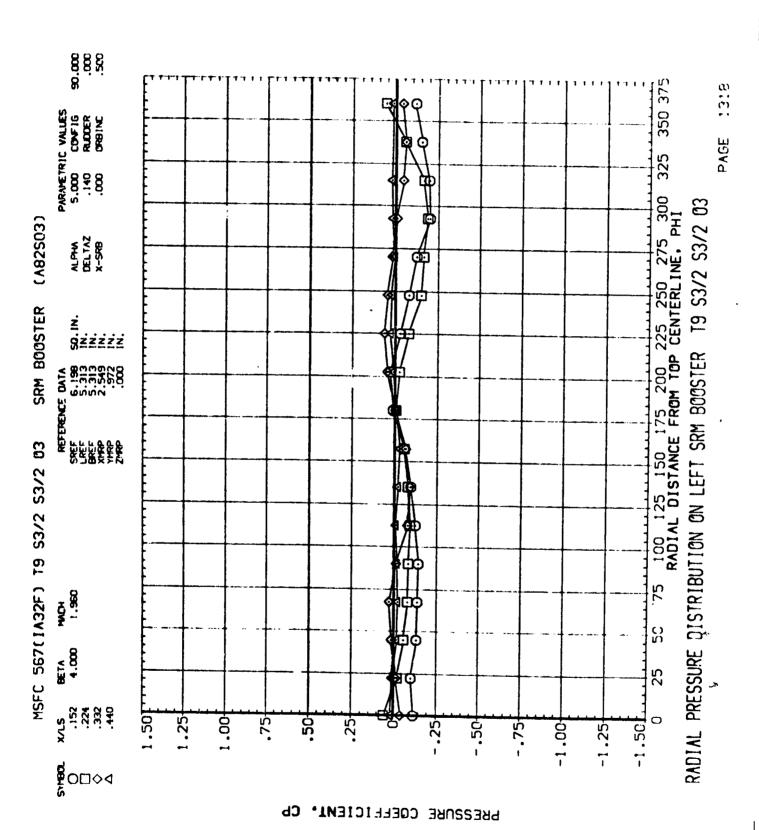
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RADIAL PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER

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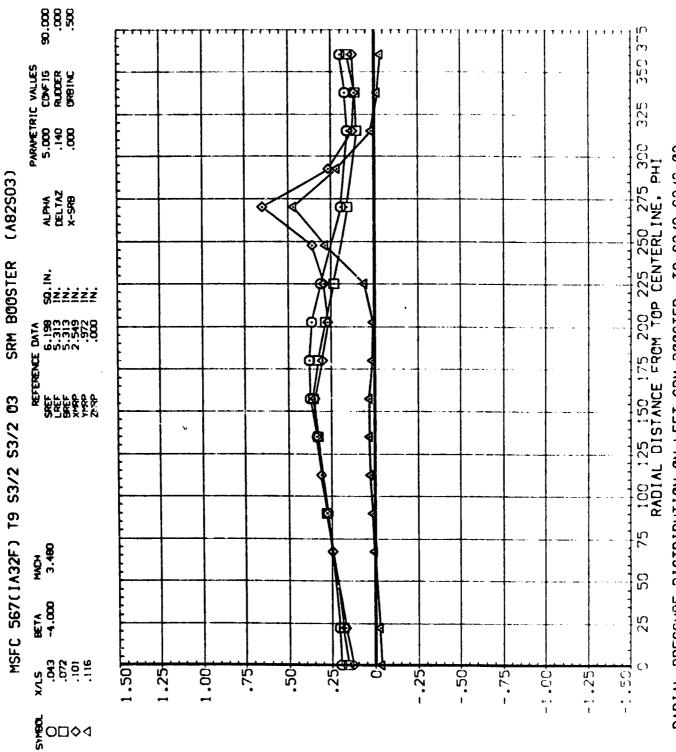
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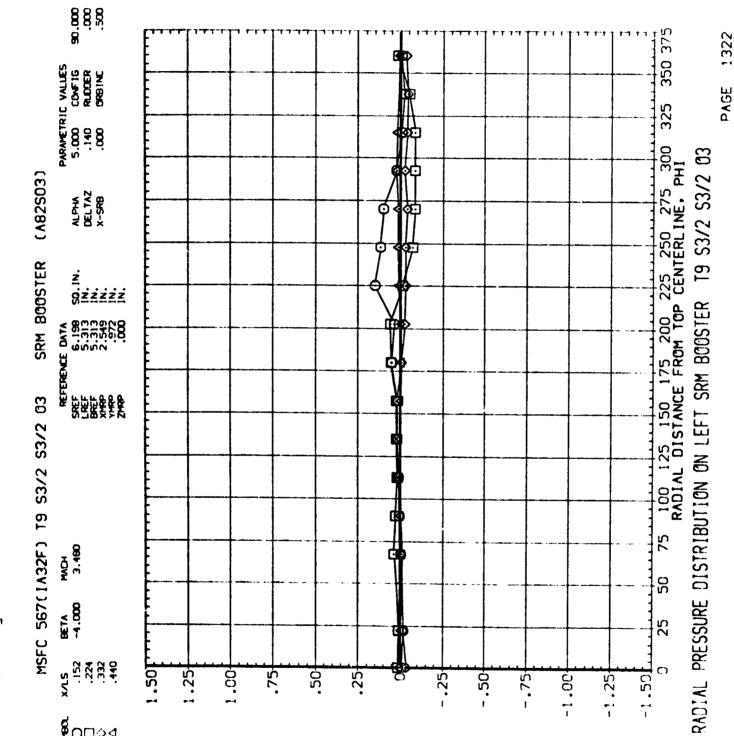
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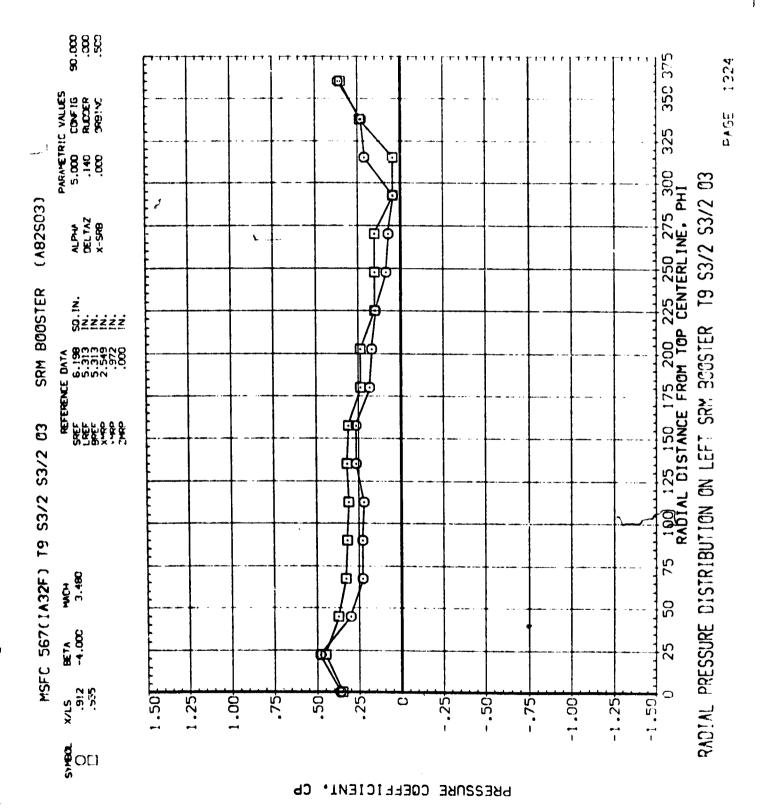
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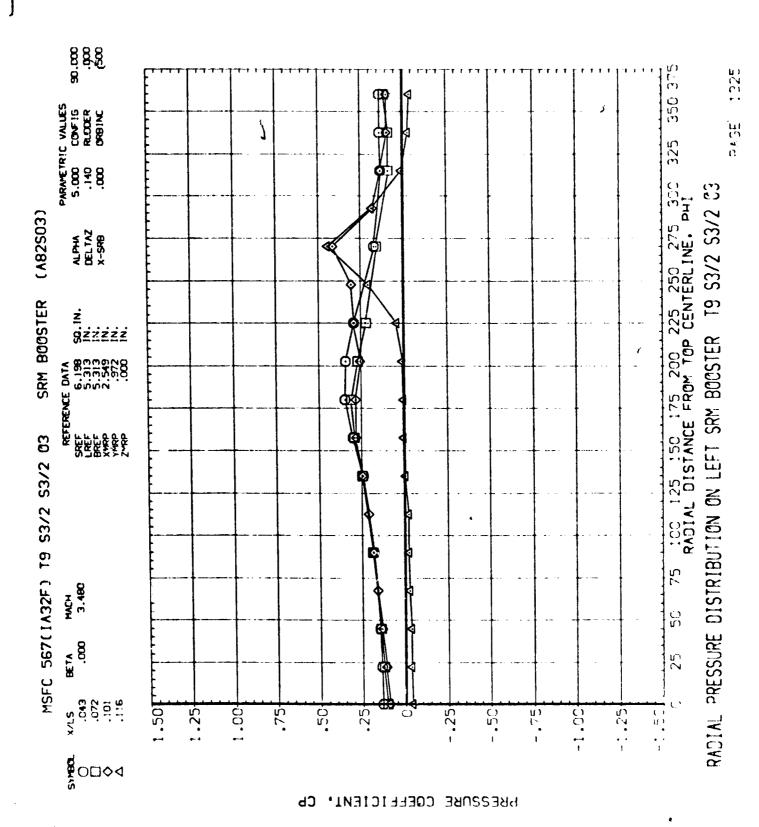
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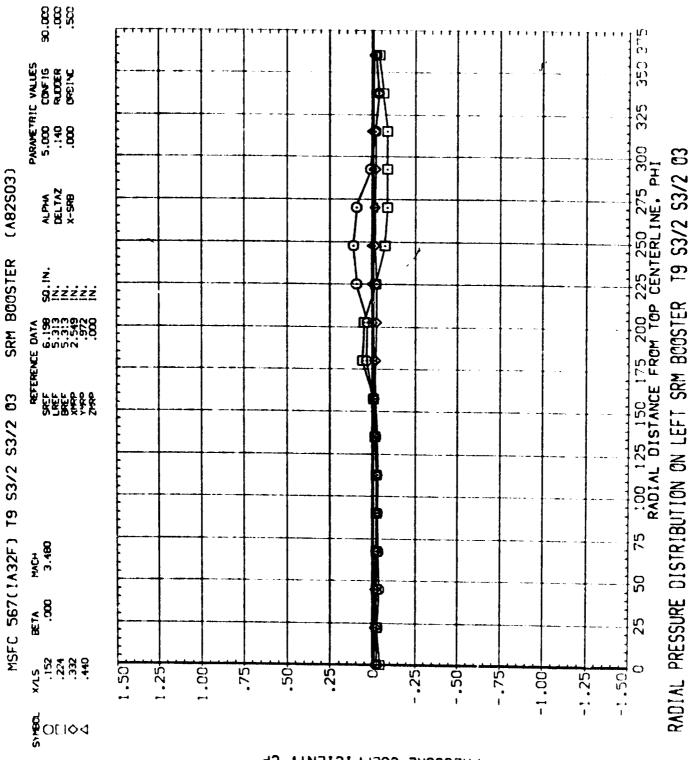
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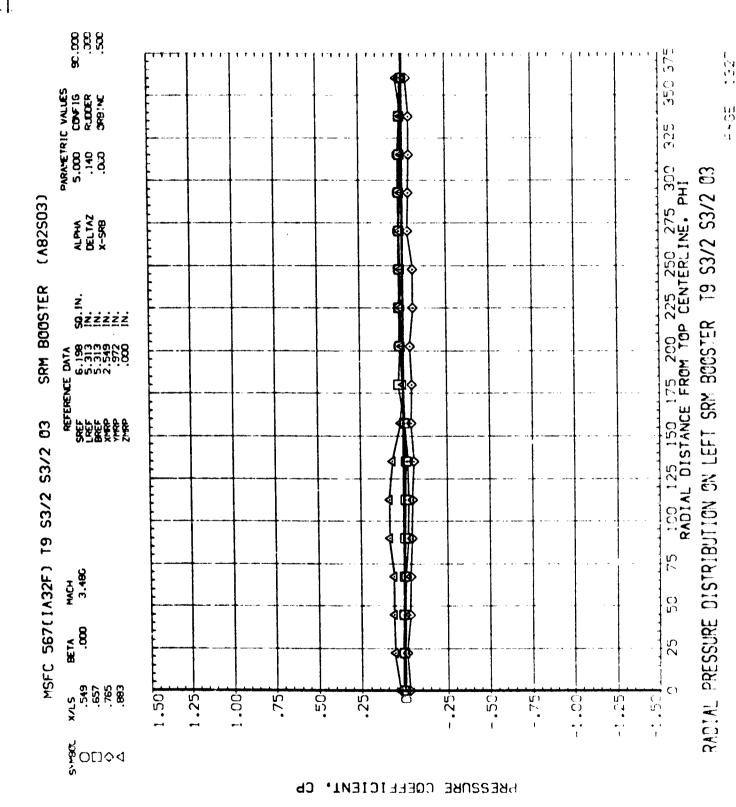
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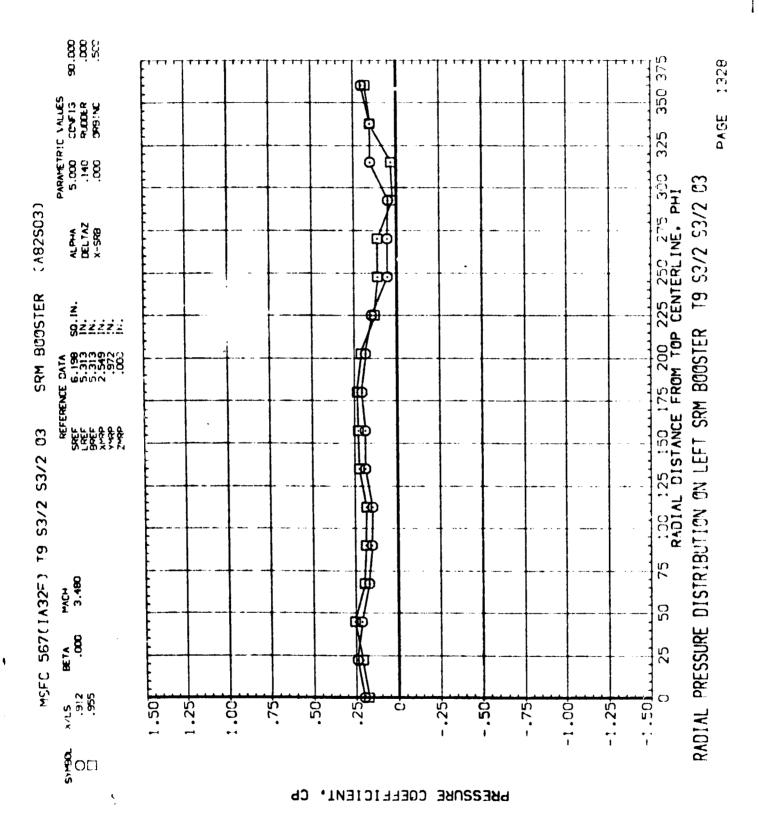


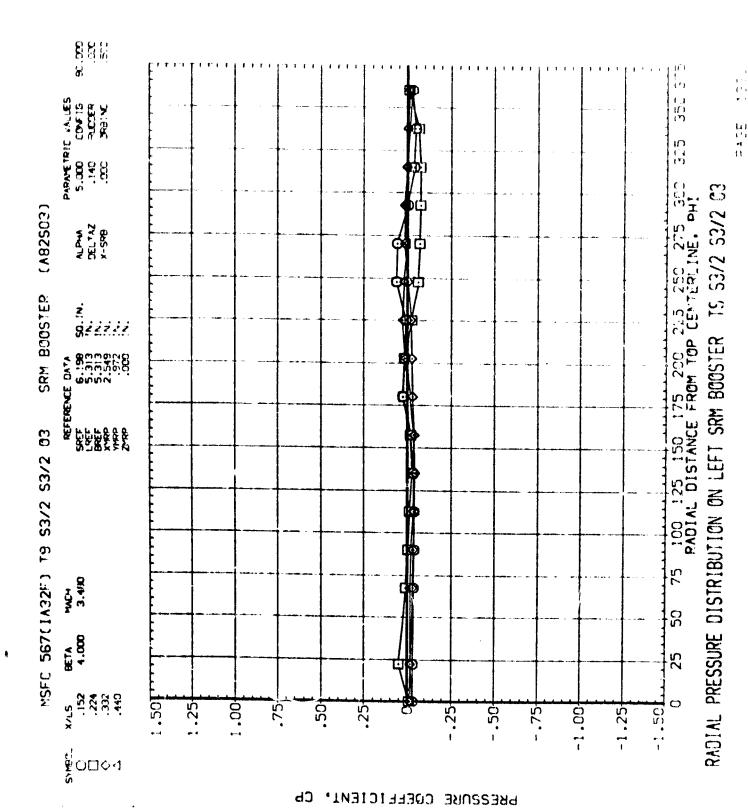


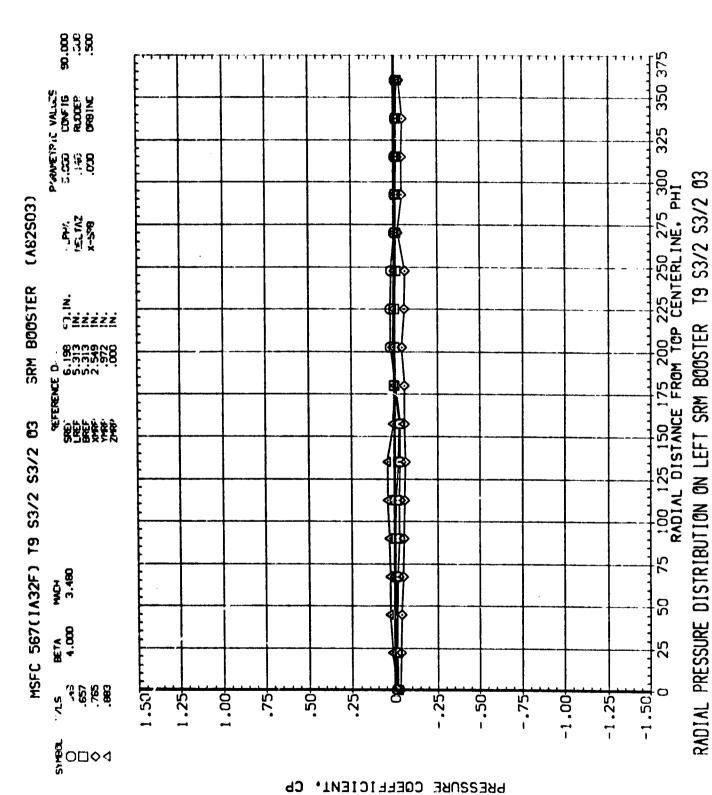


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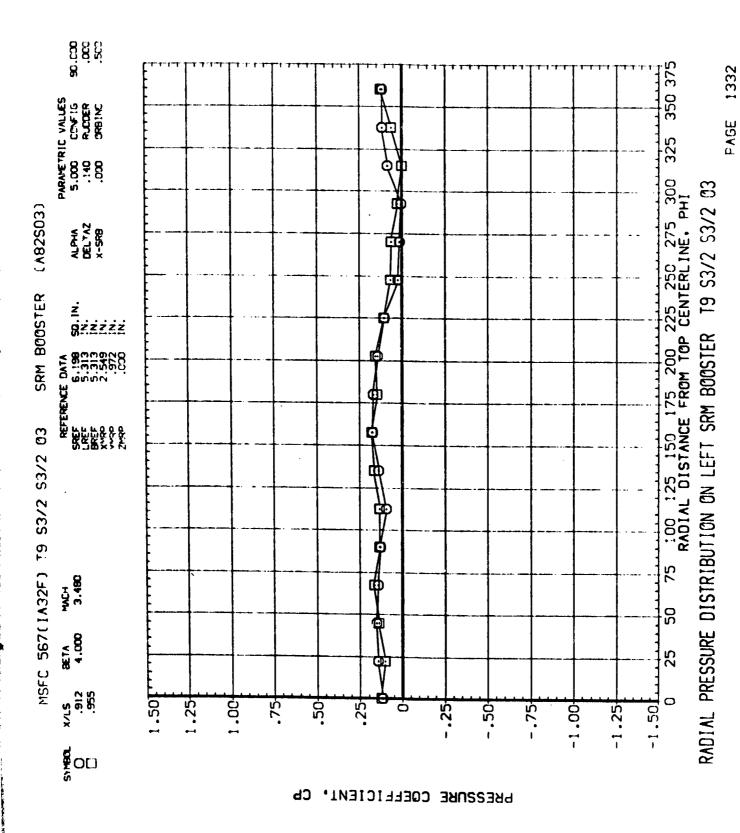


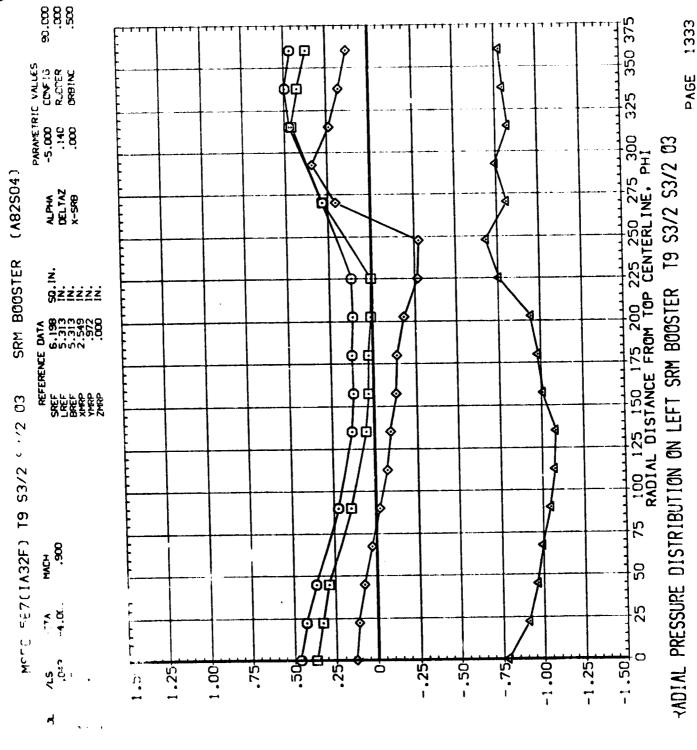




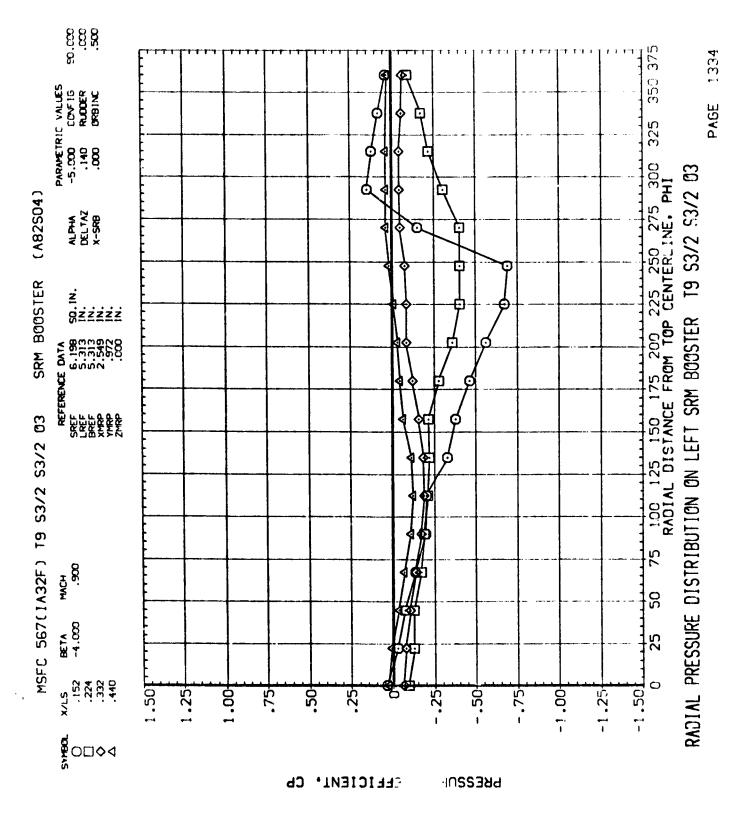


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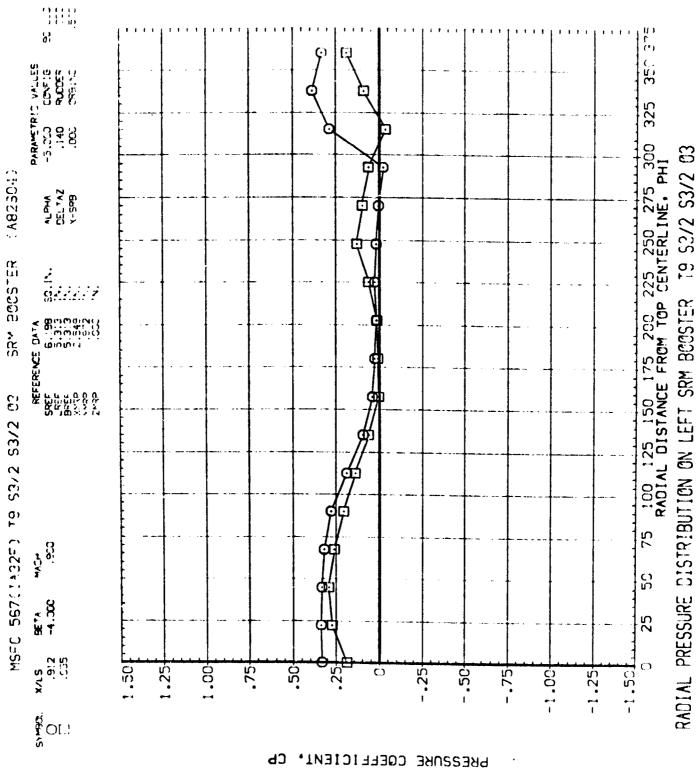


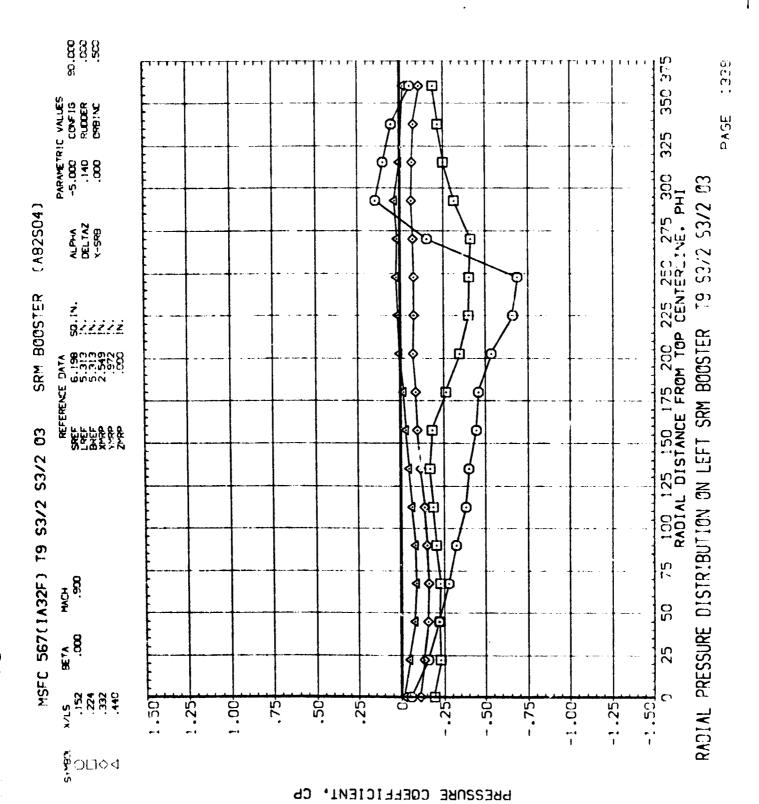
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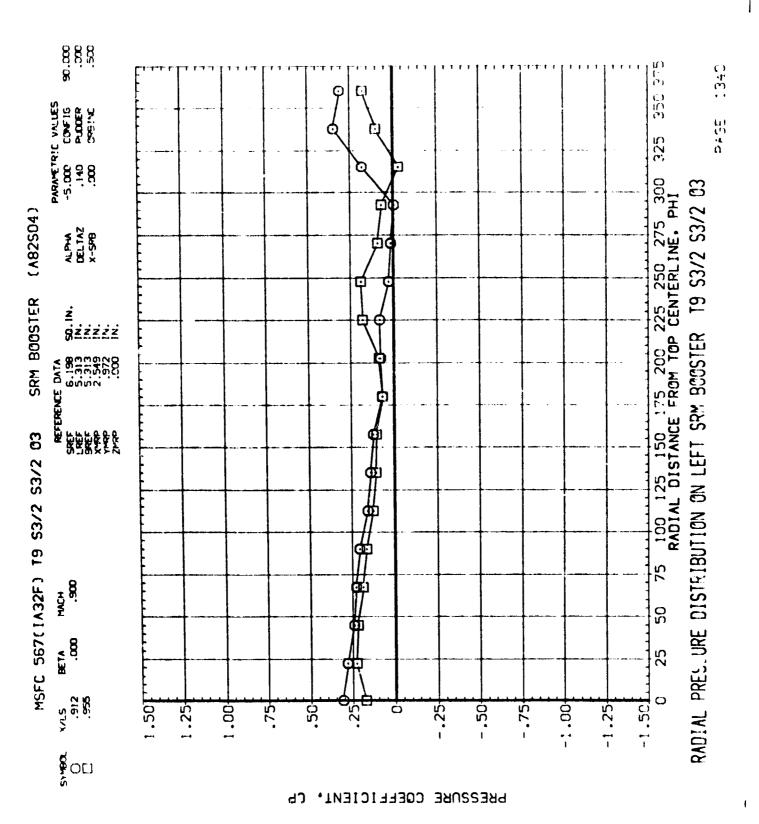
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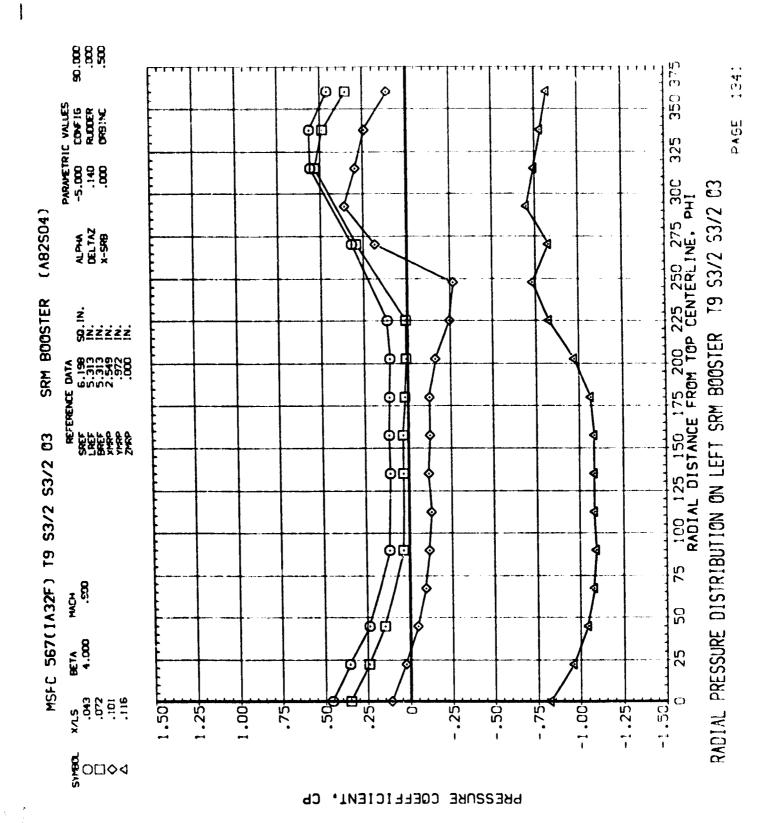
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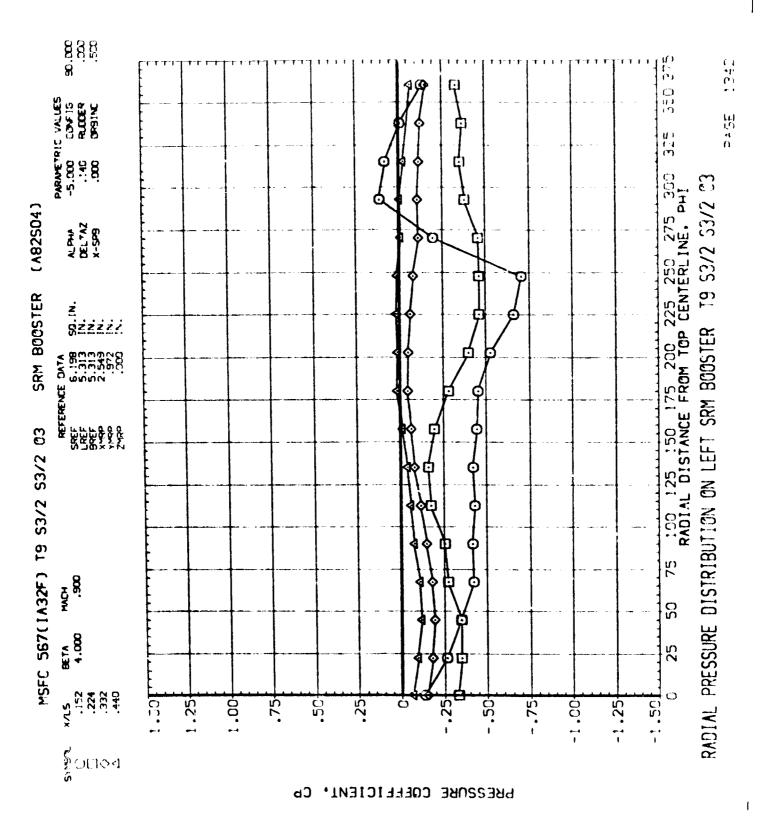
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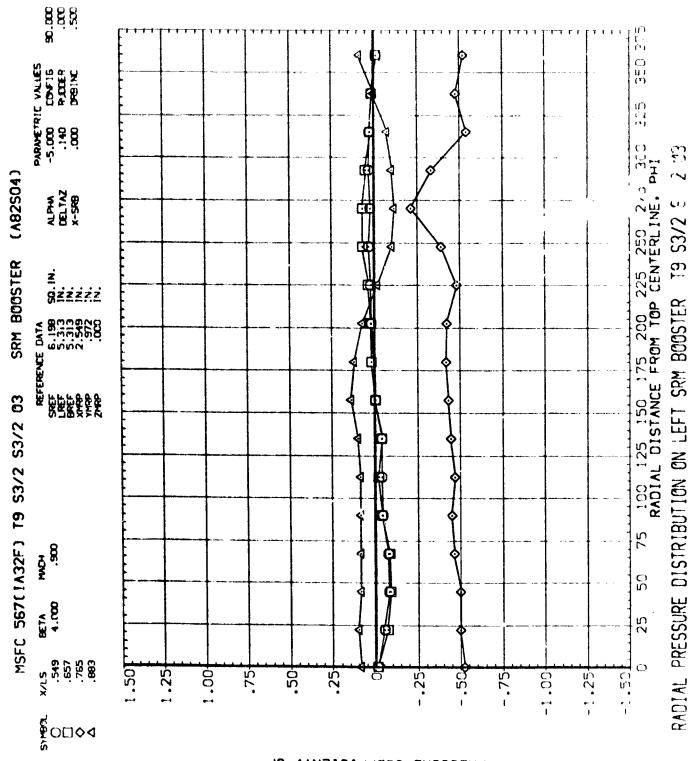




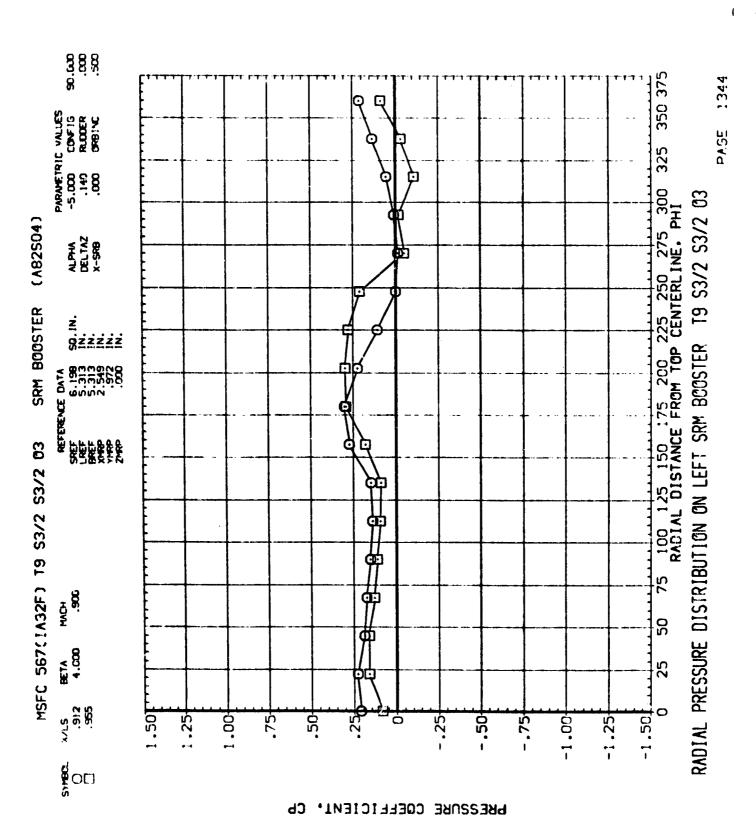




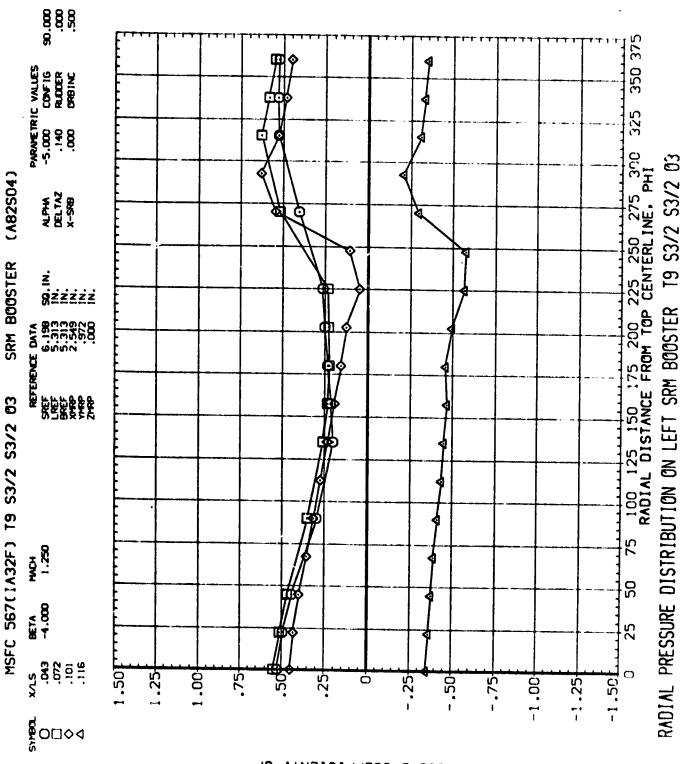




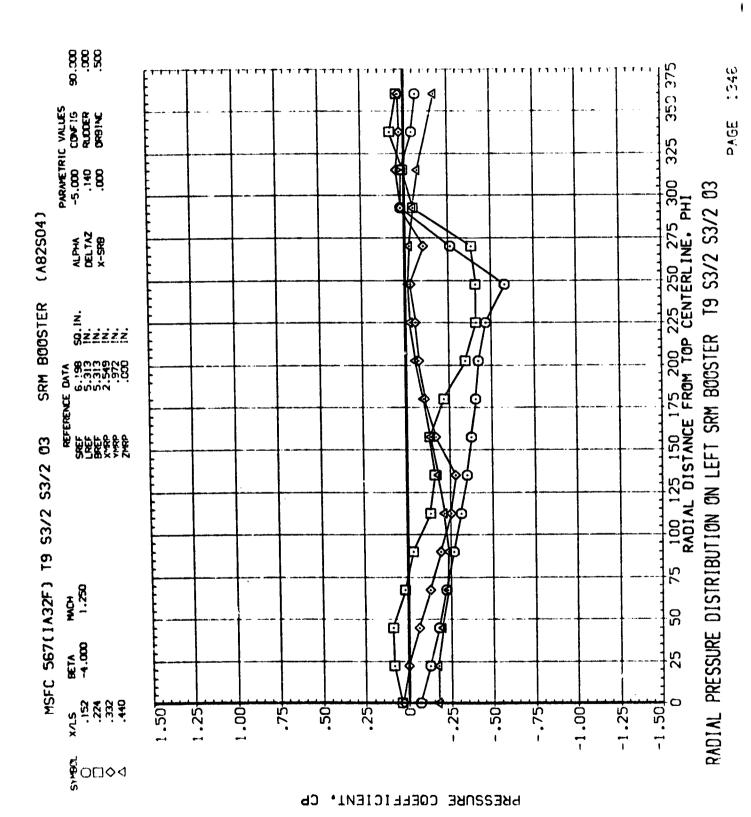
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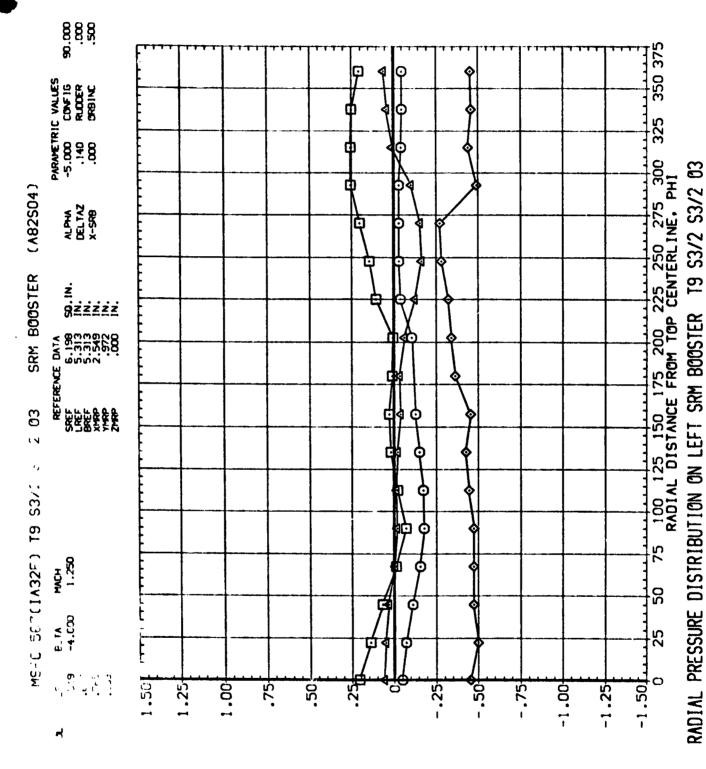


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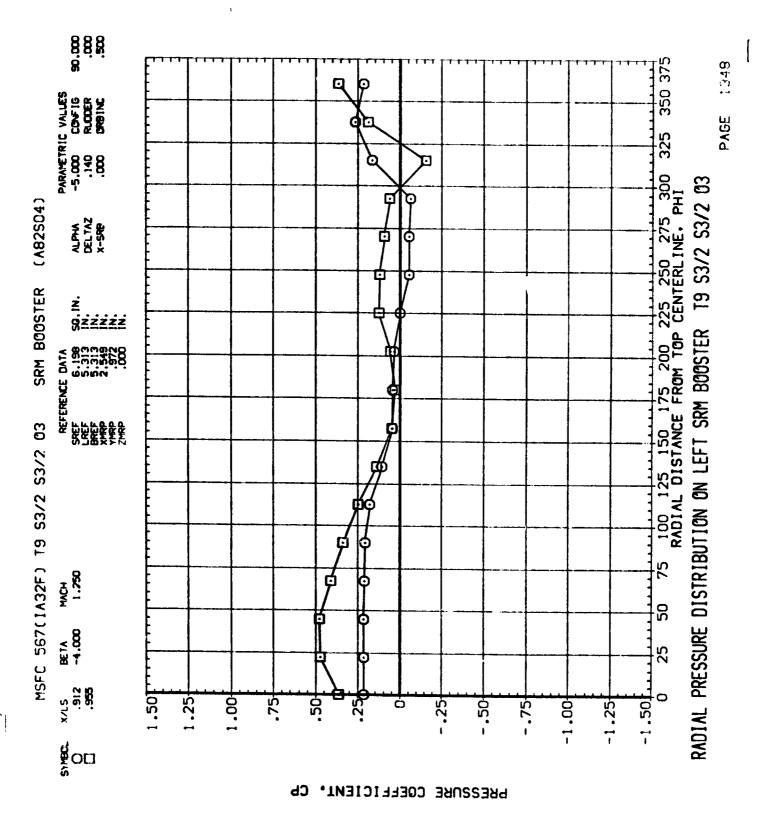


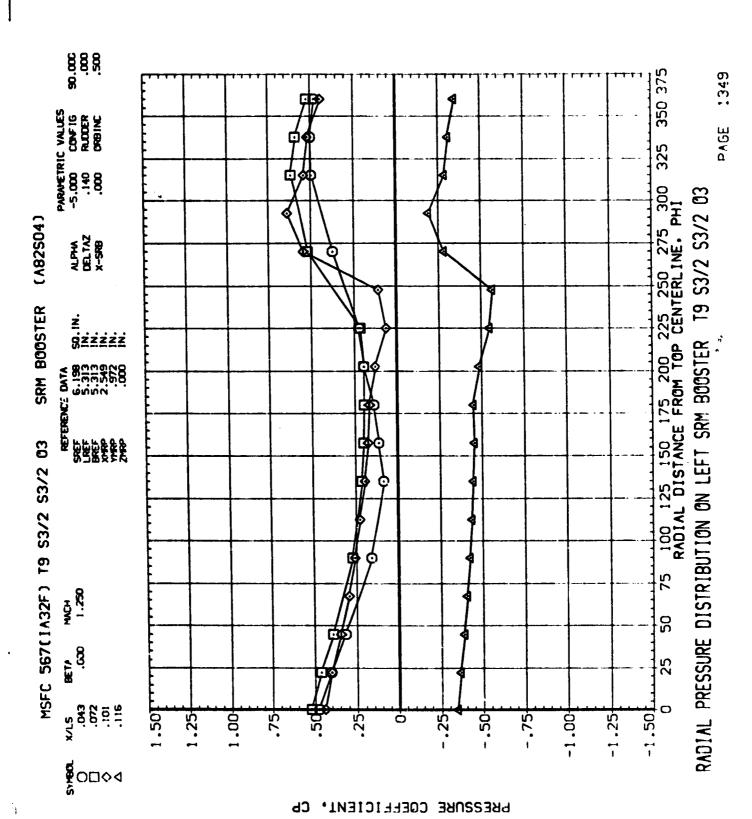
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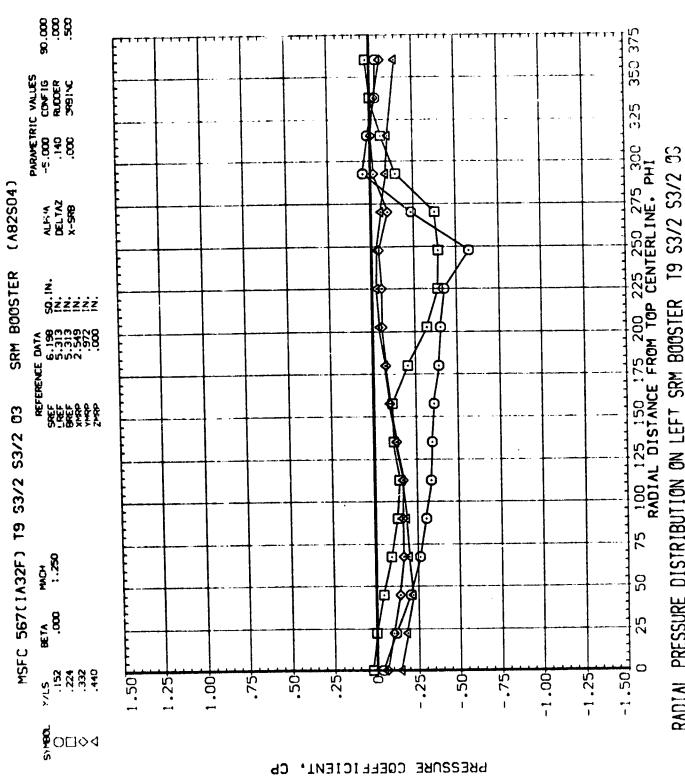




PRESSURE COEFFICIENT, CP







RADIAL PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER

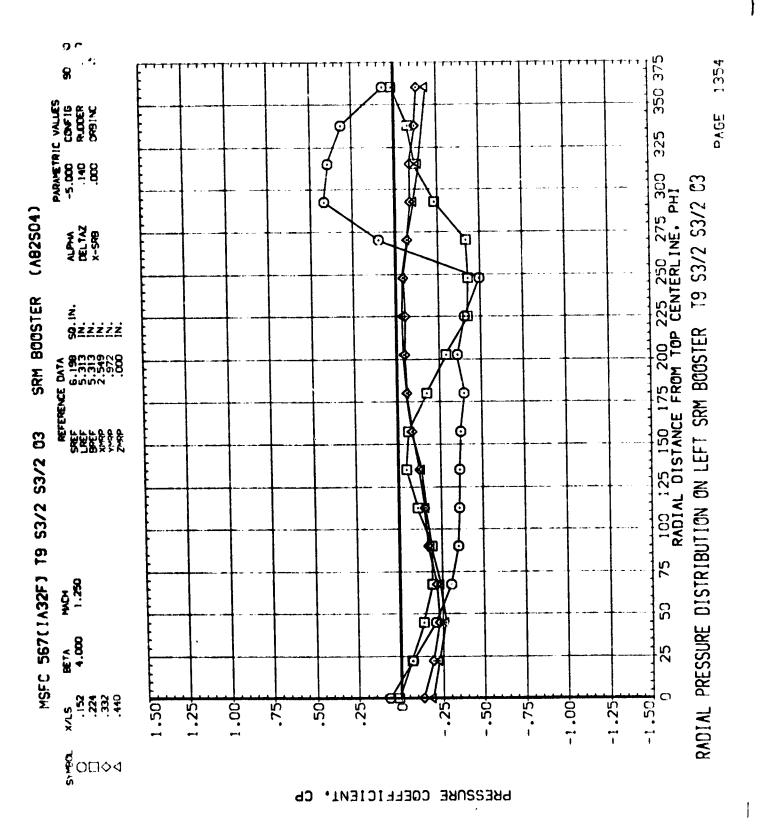
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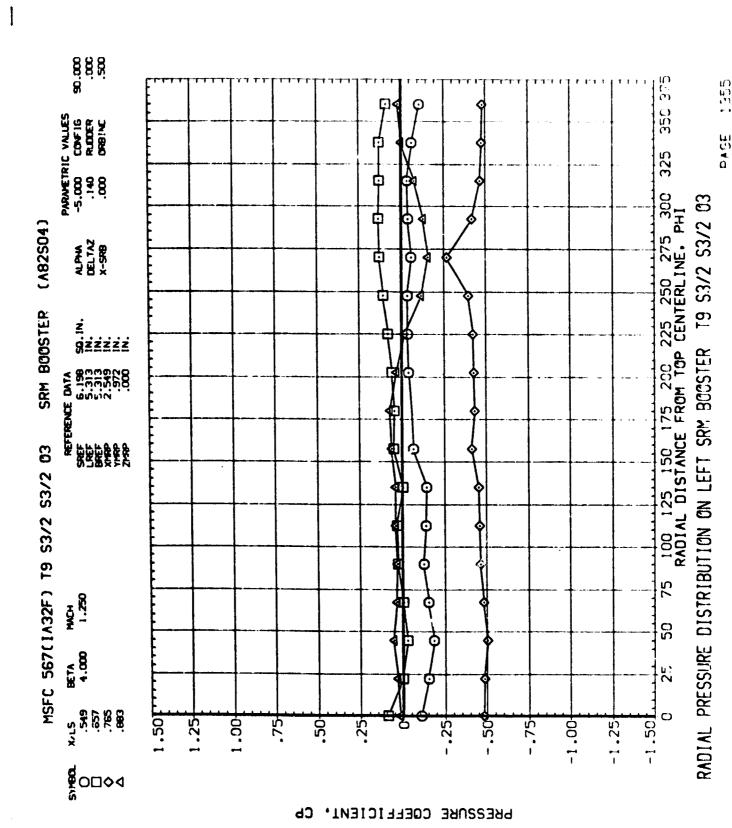
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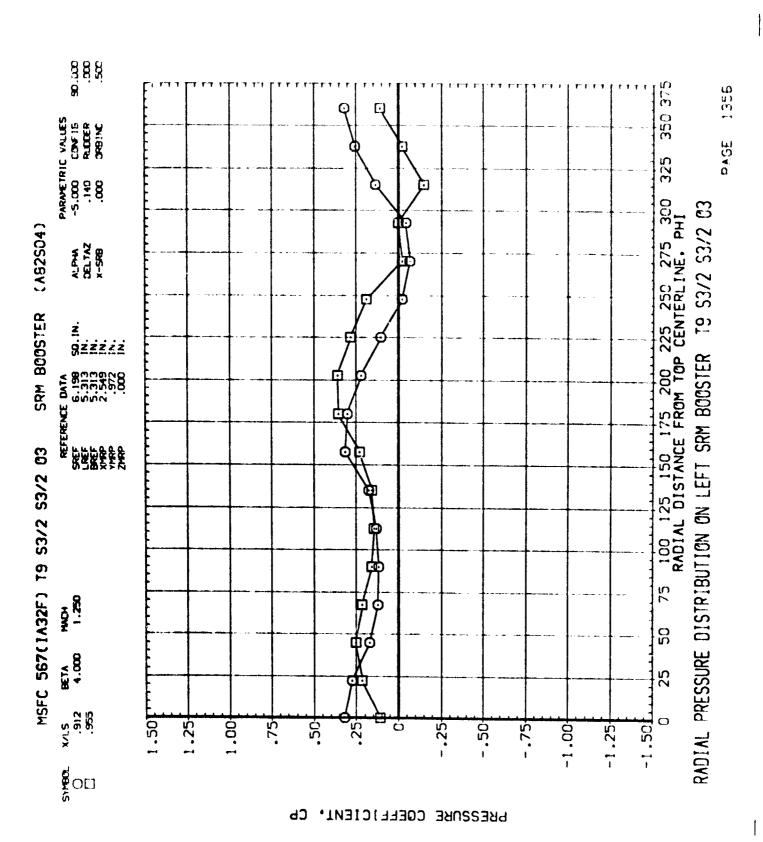
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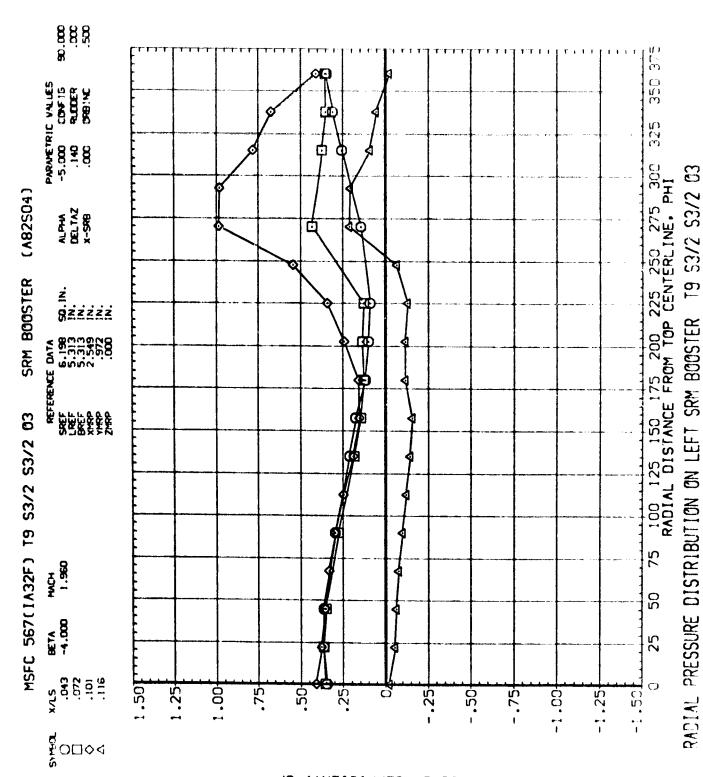
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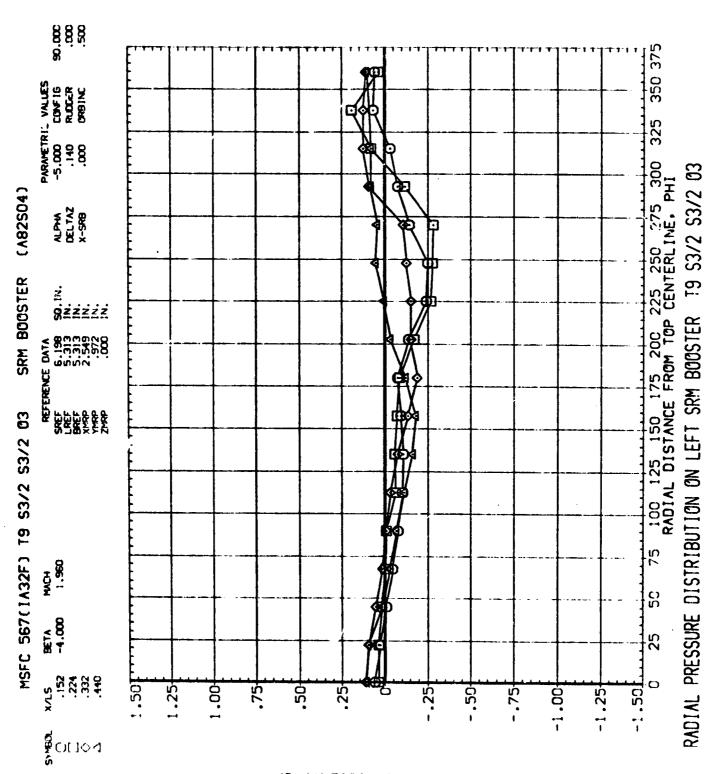




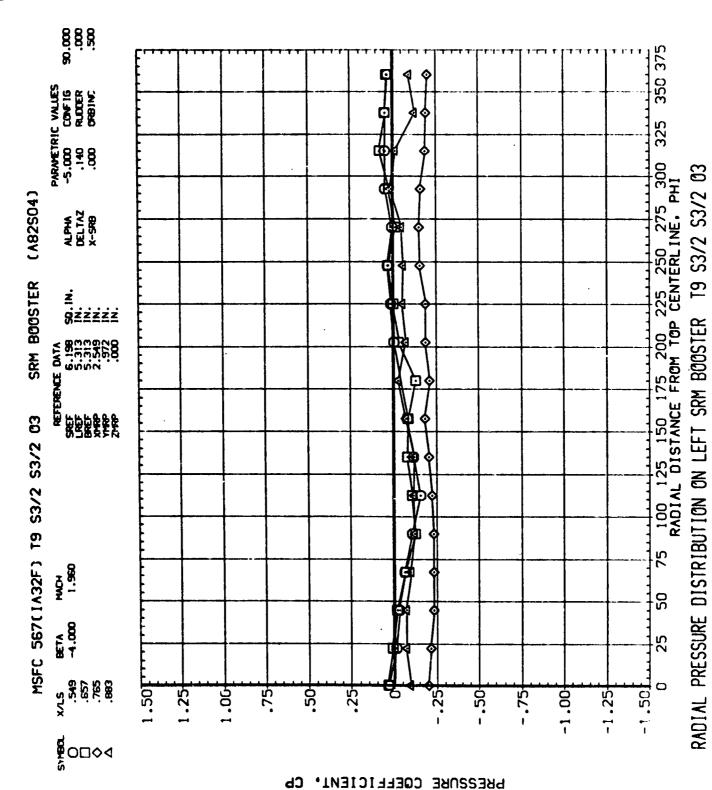


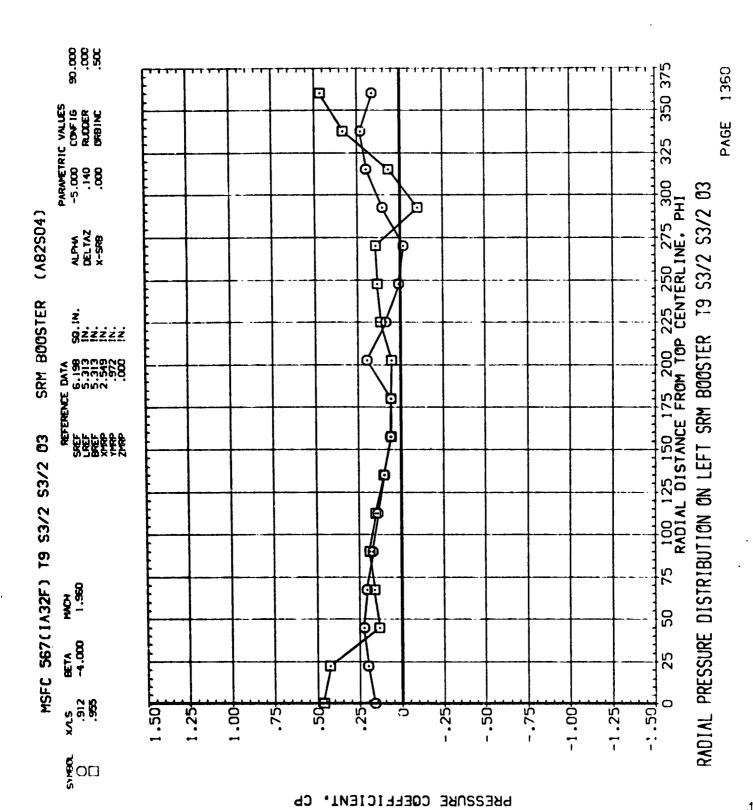


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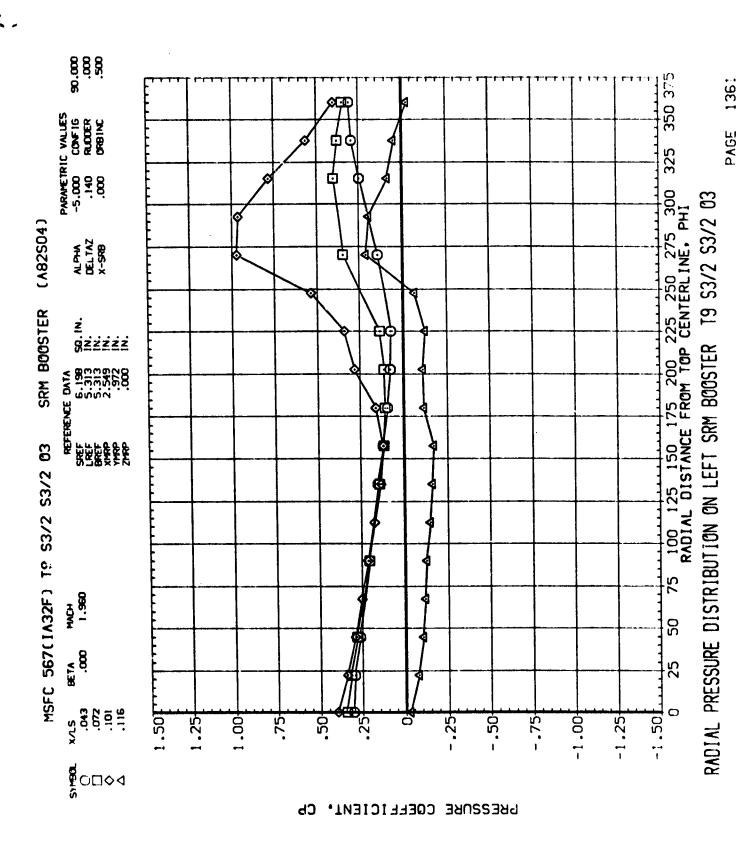


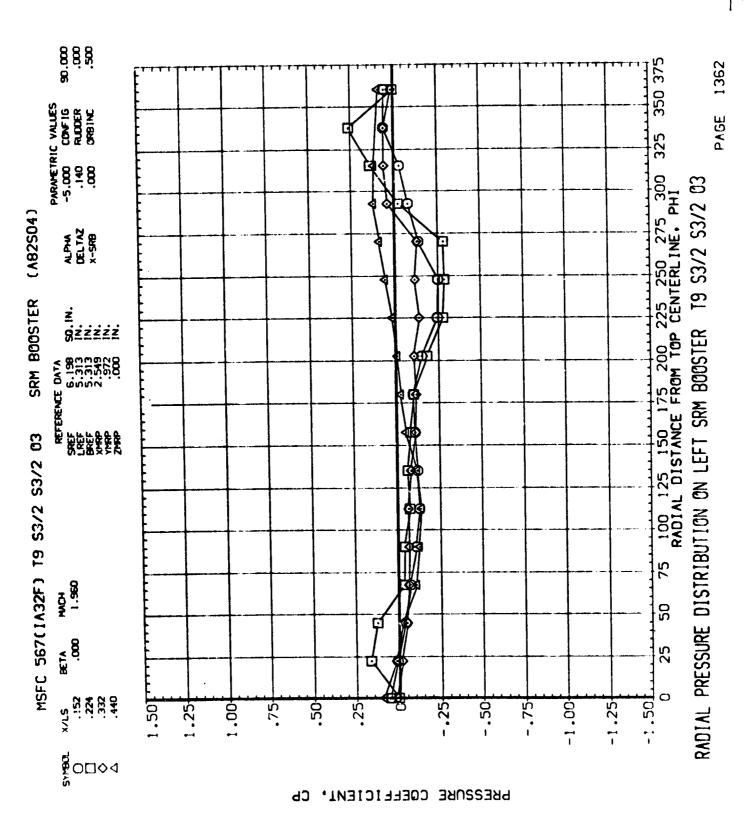
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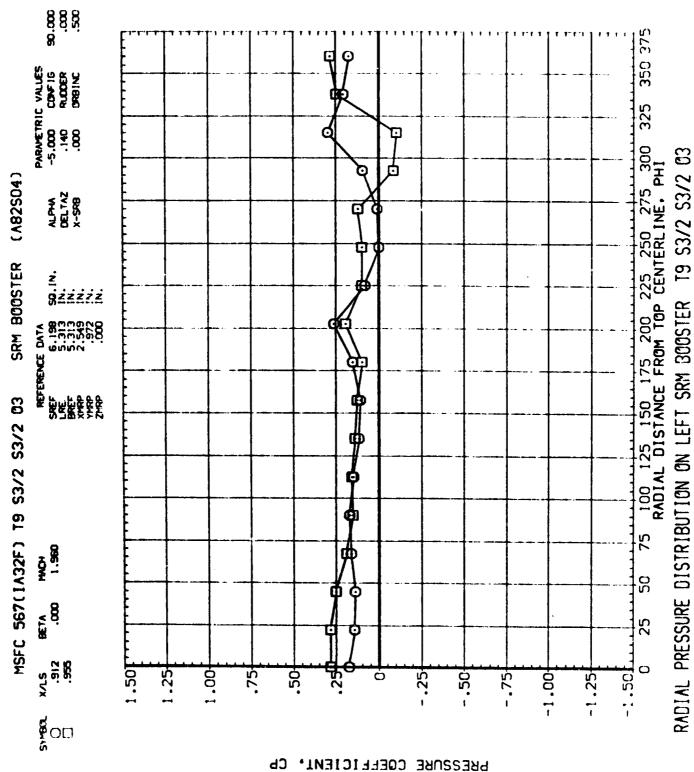


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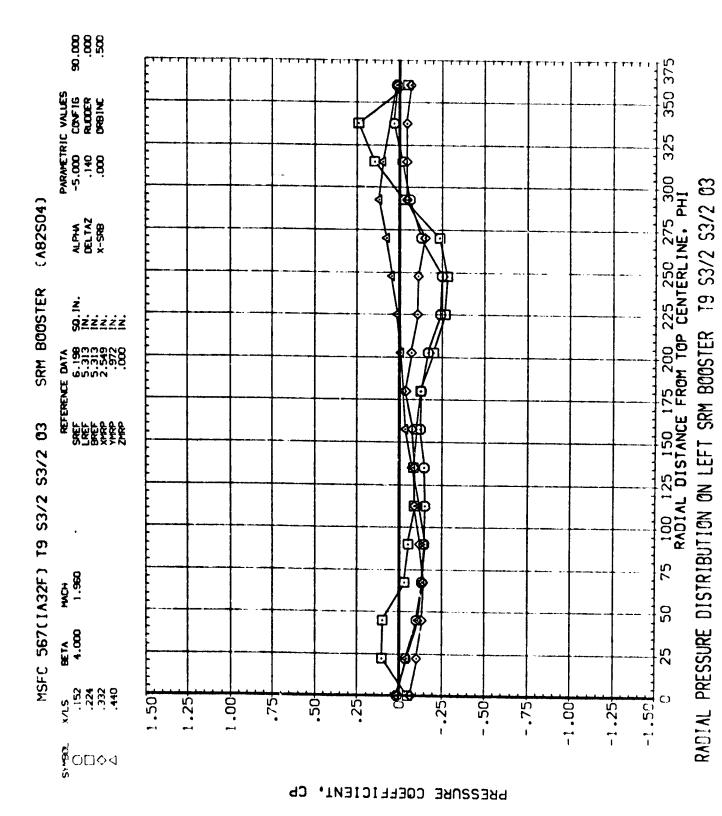




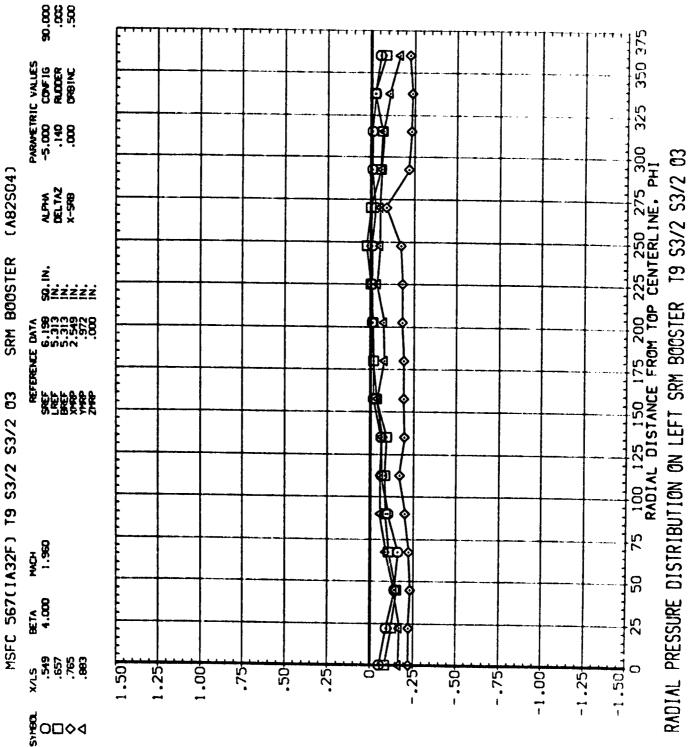
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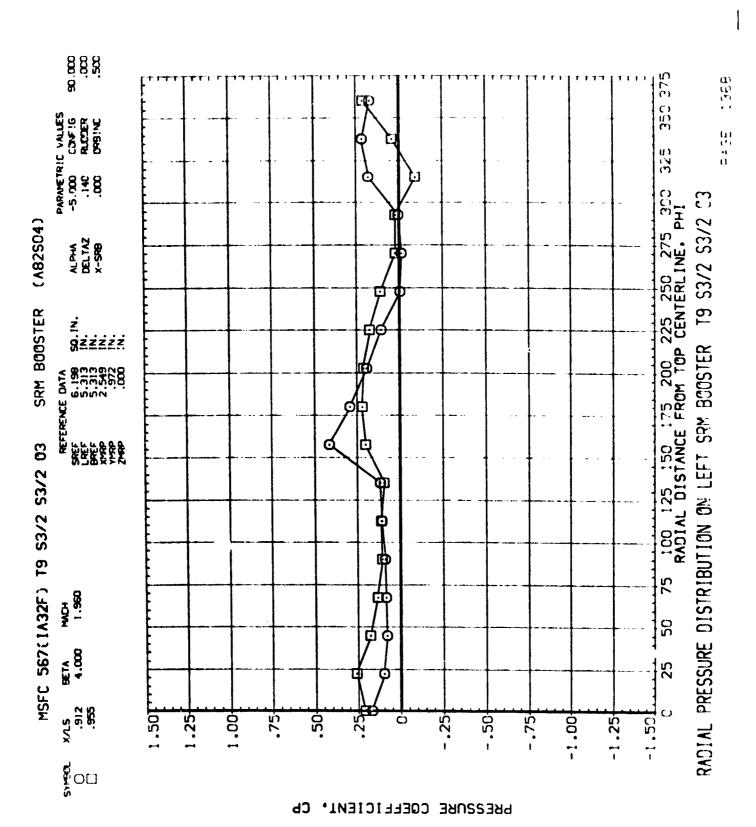


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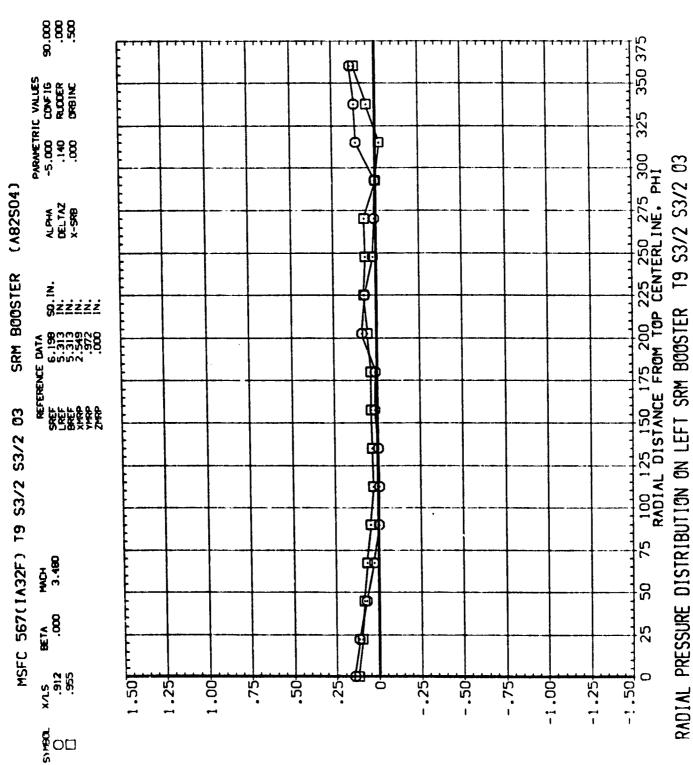
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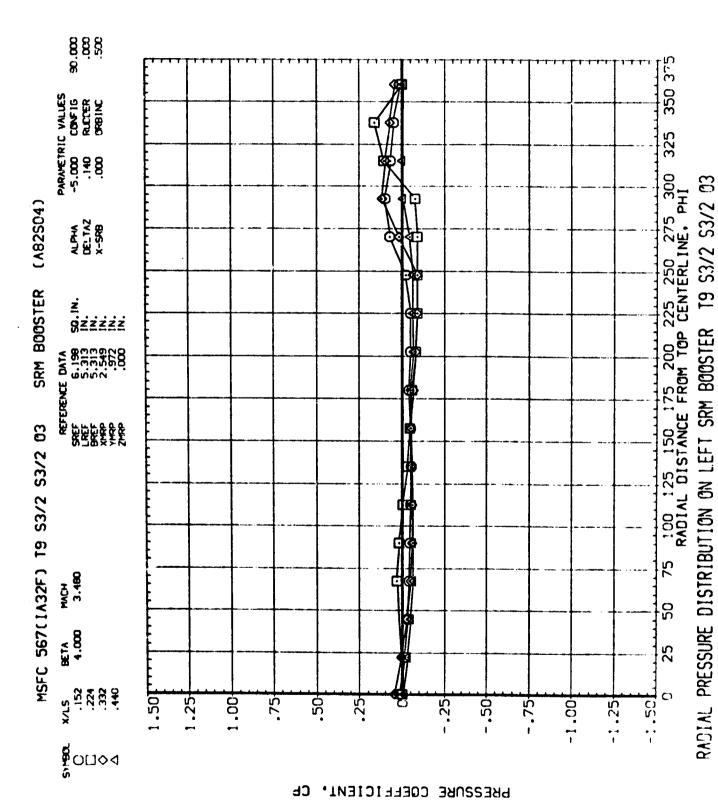
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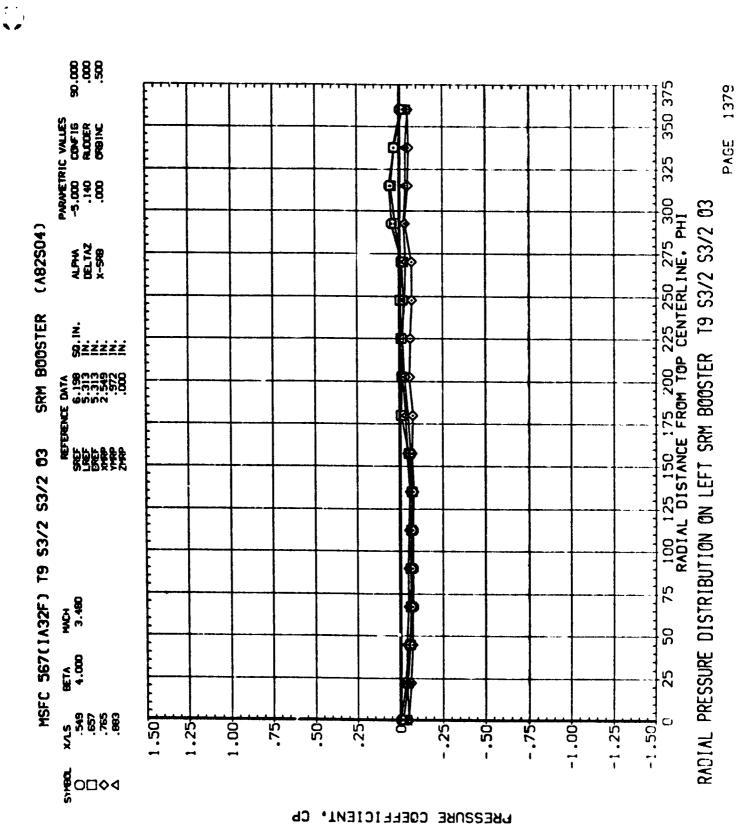
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PRESSURE COEFFICIENT, CP

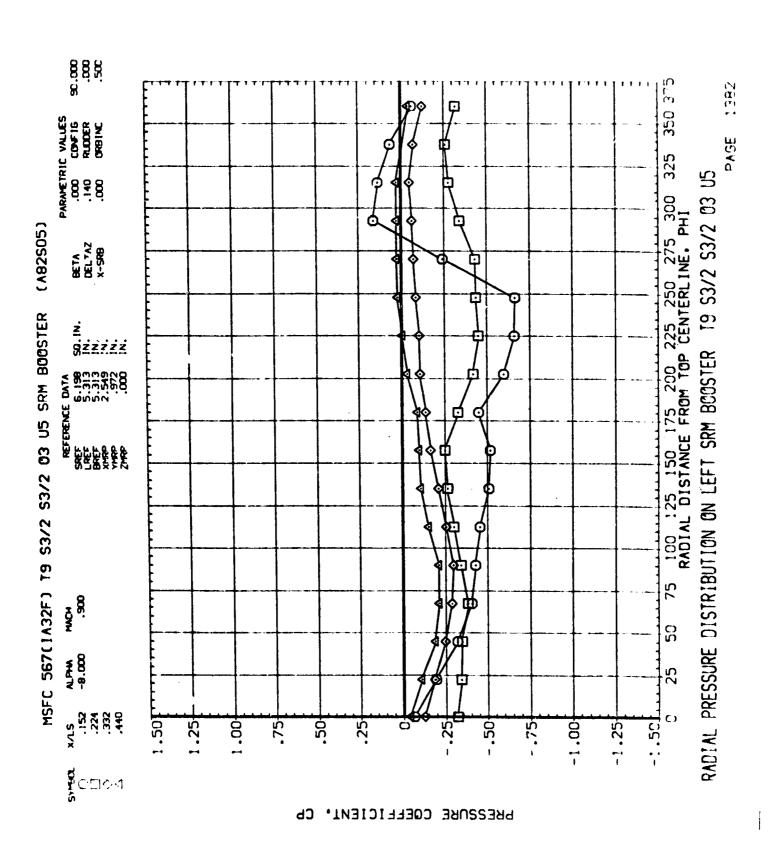
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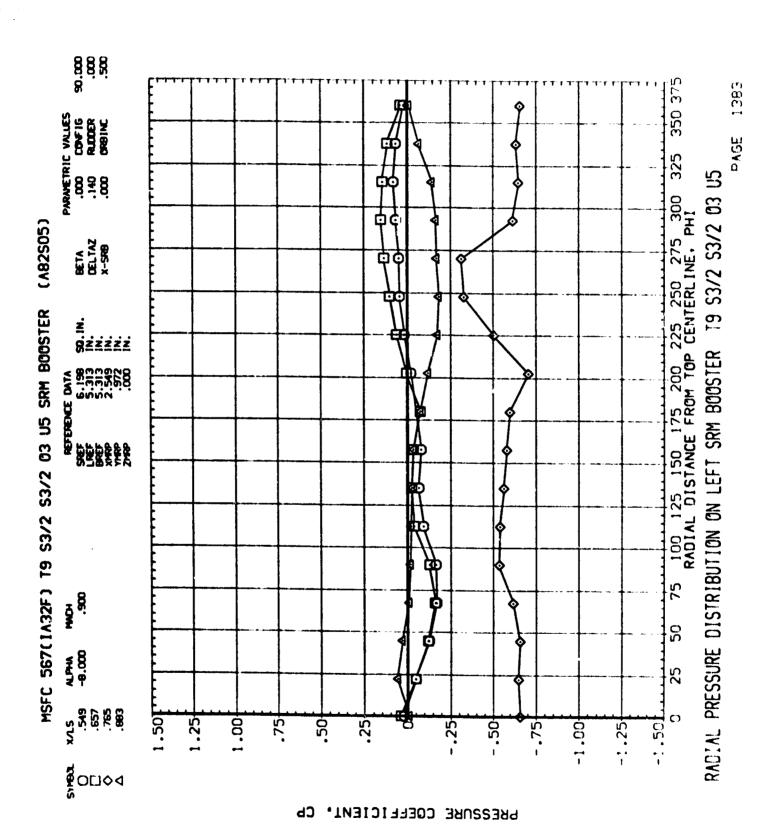


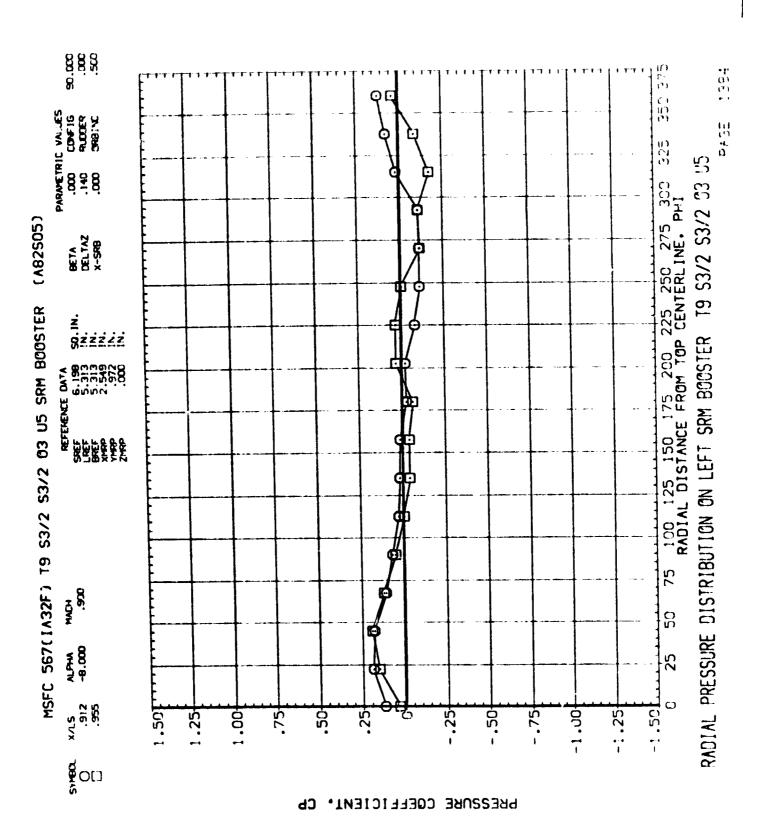


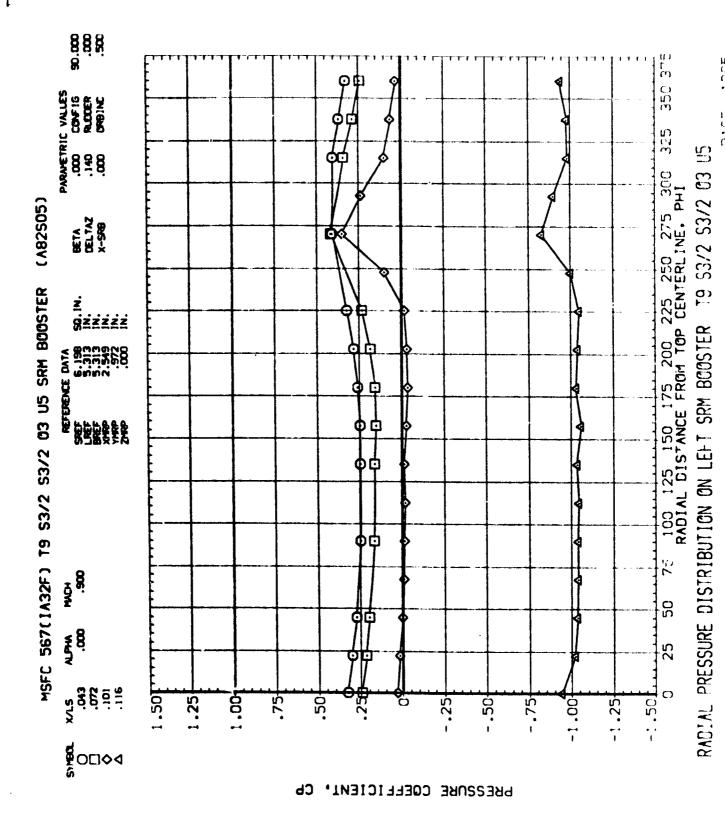
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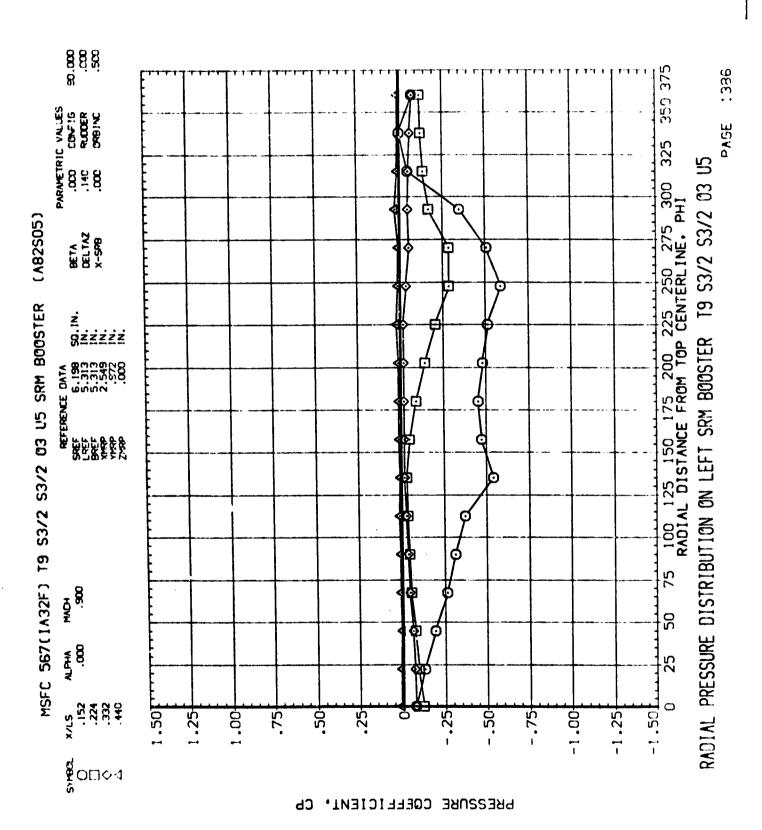
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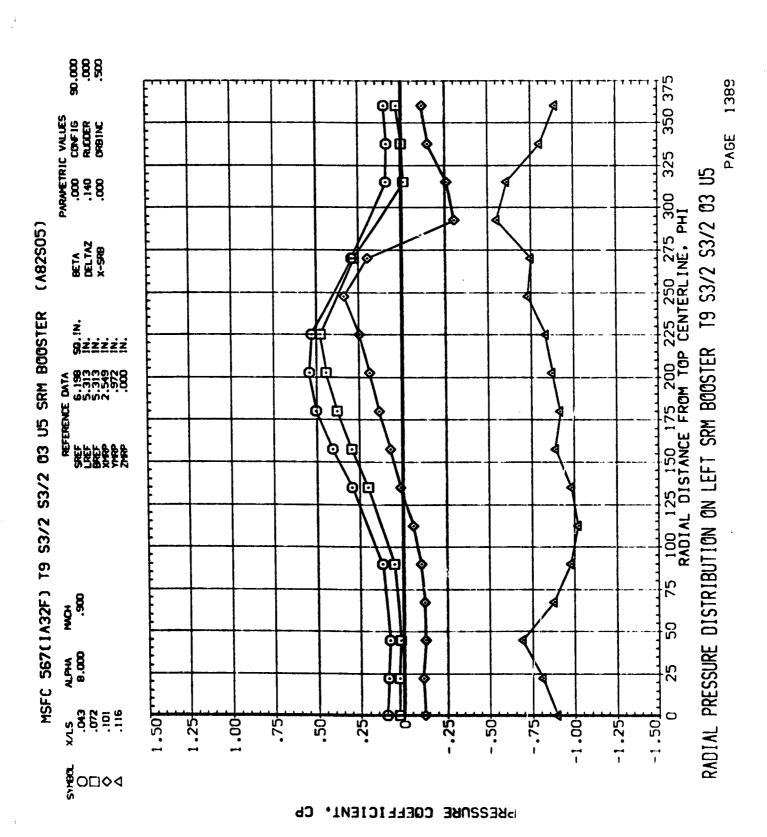




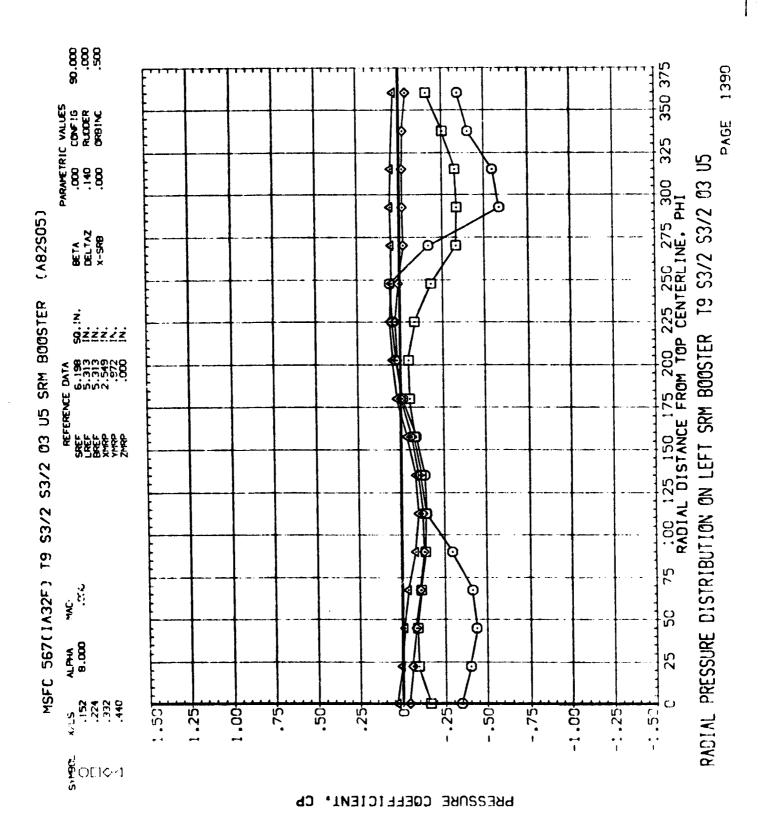
RADIAL PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER T9 S3/2 S3/2 03 U5

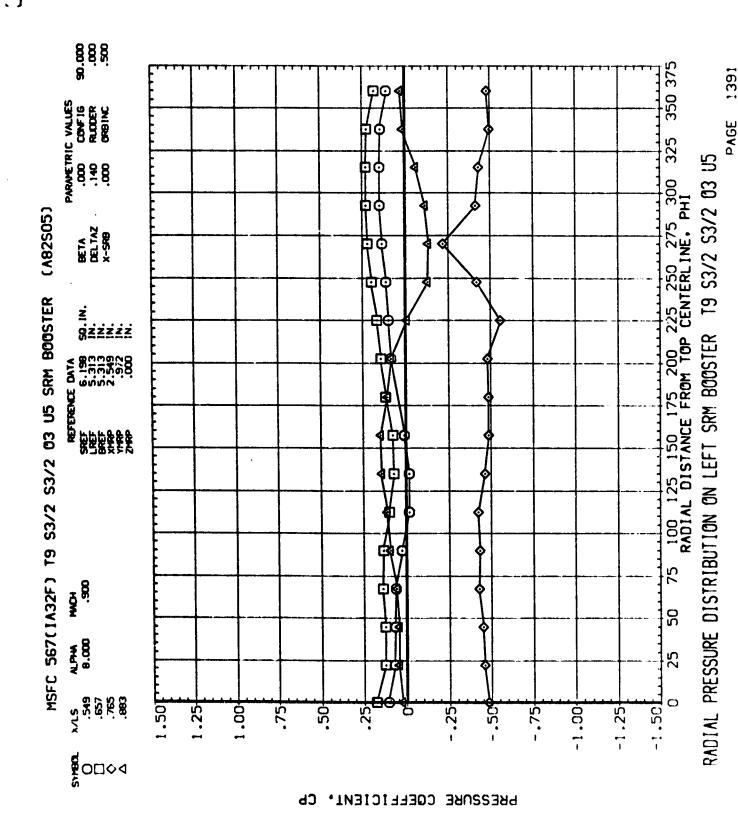
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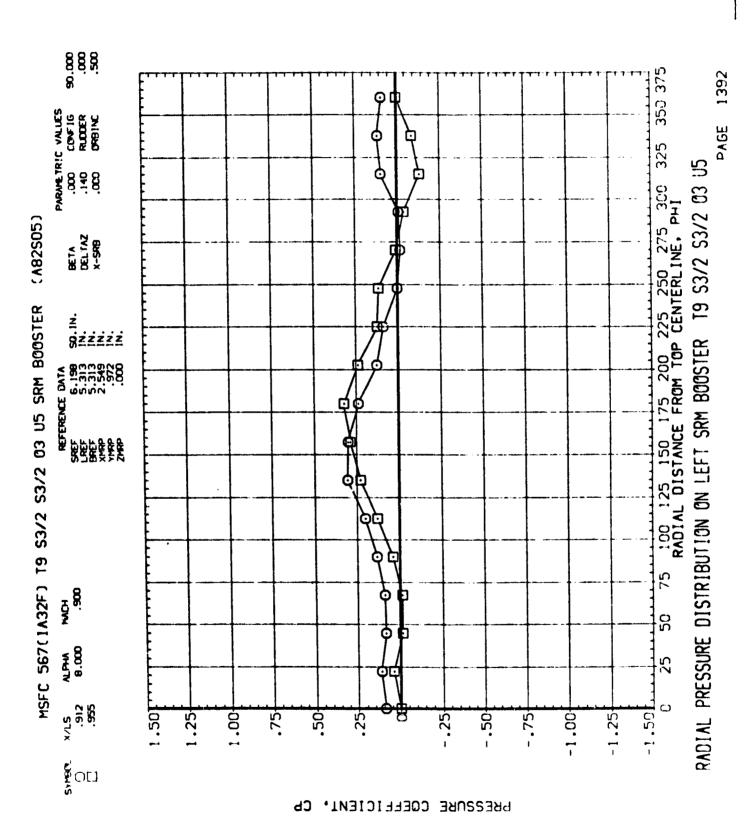
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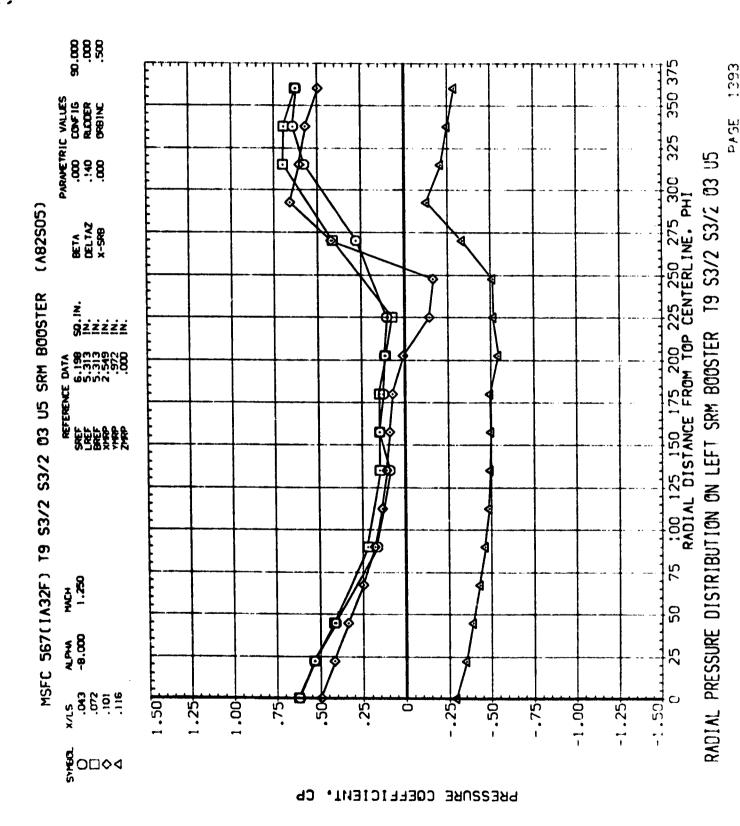


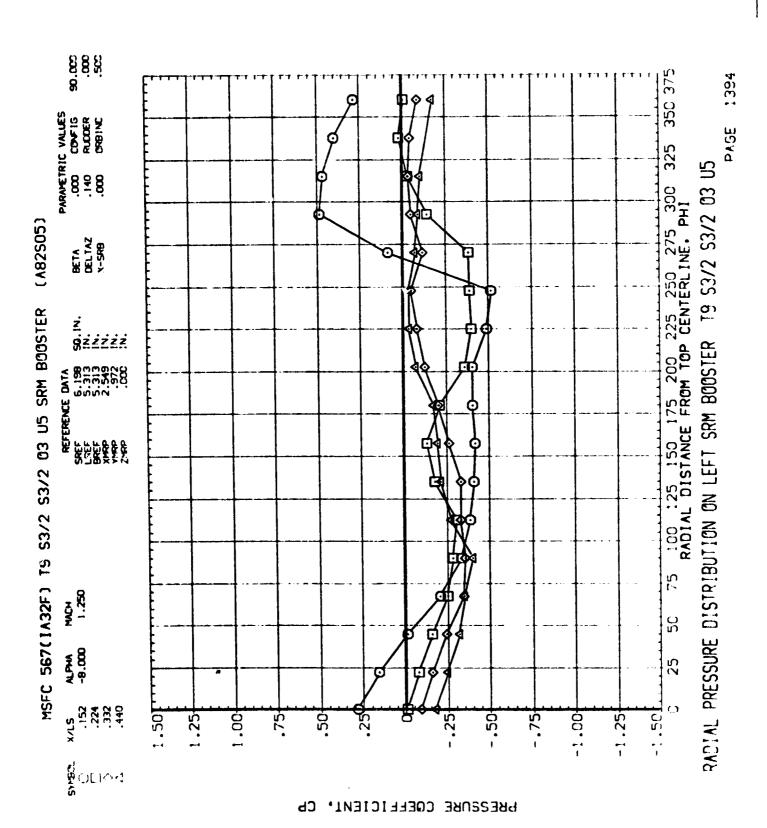
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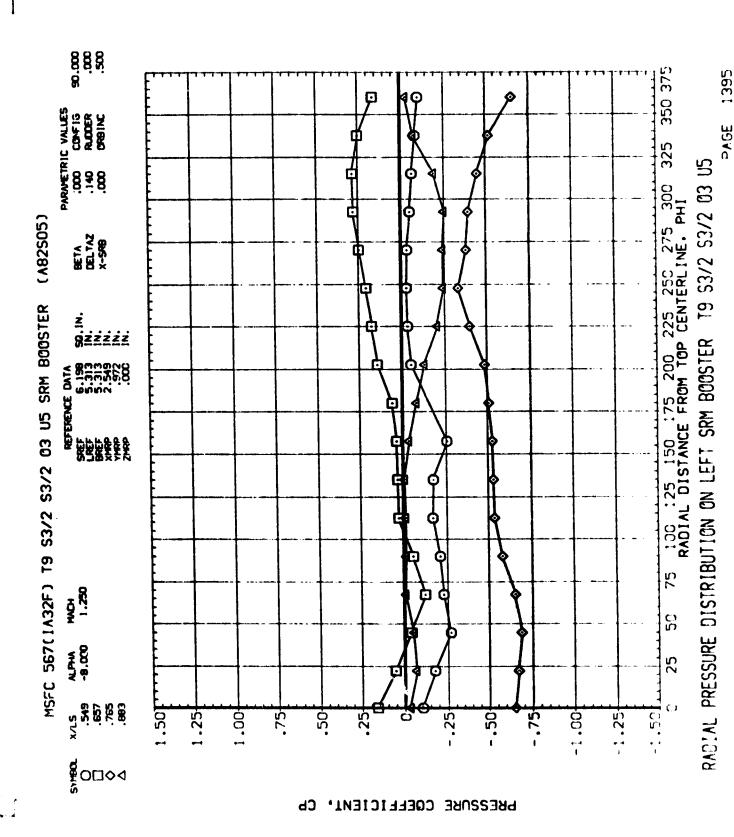


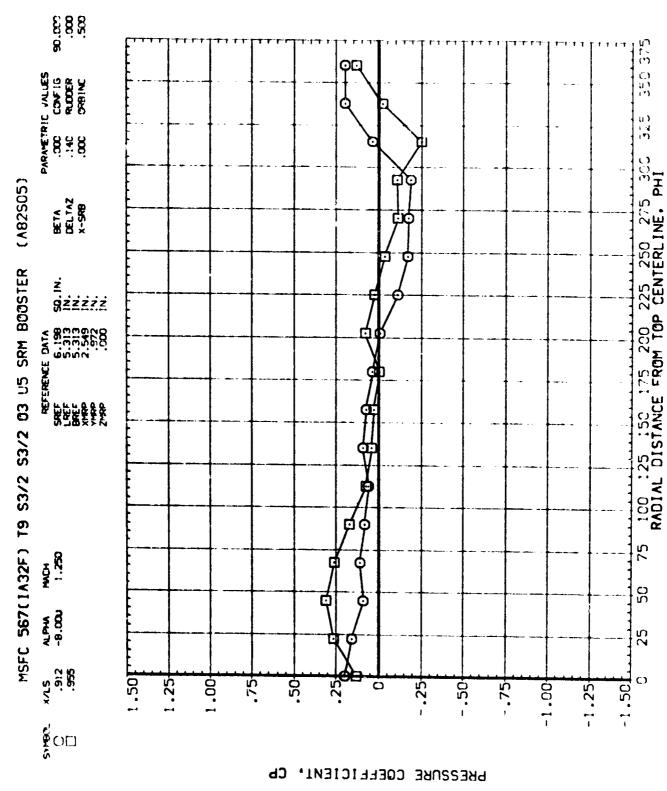






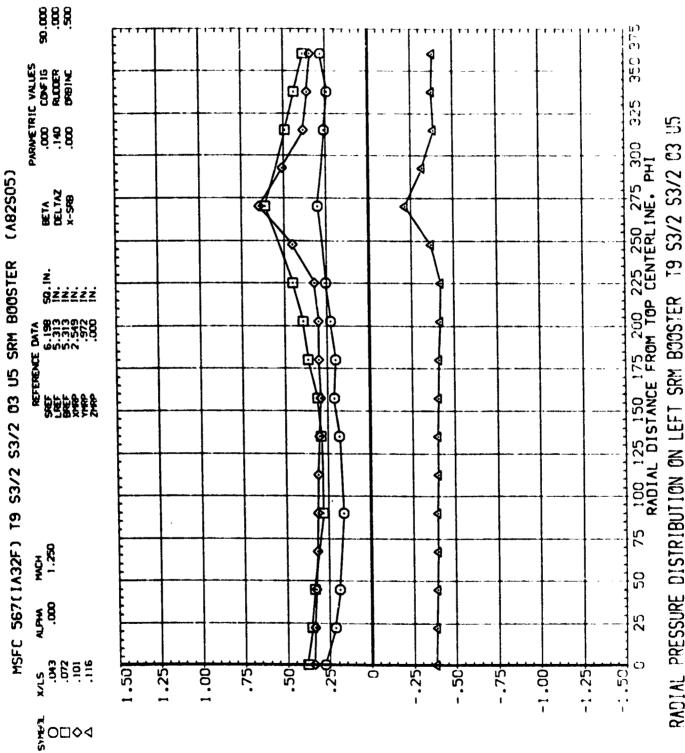






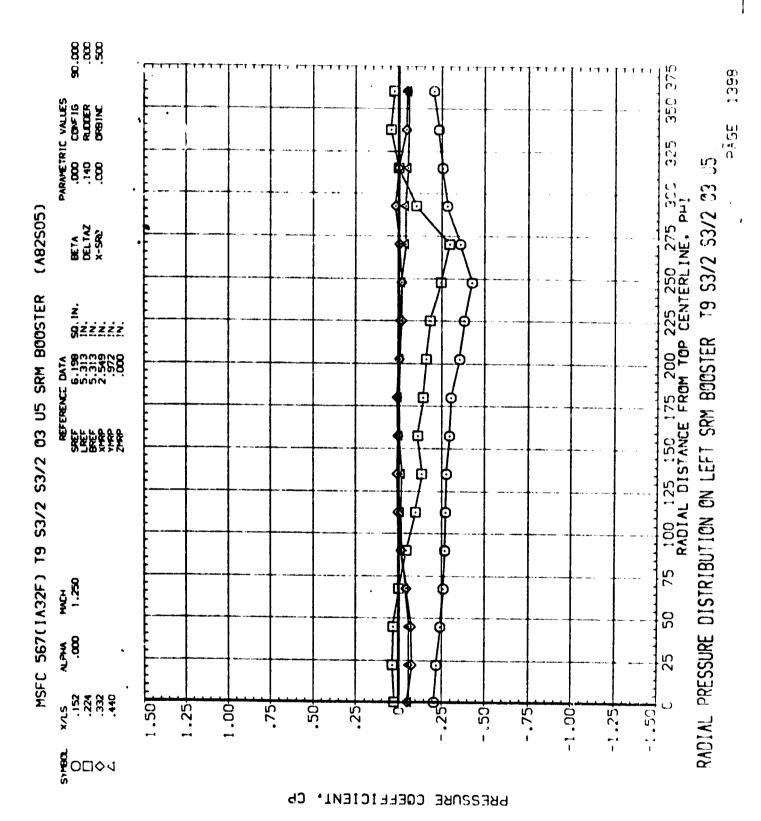
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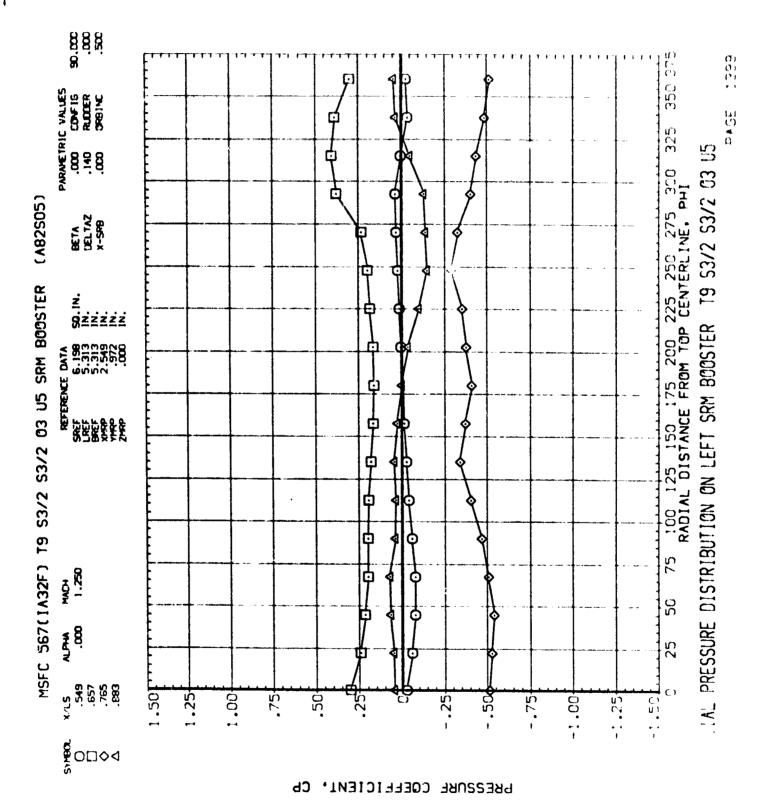
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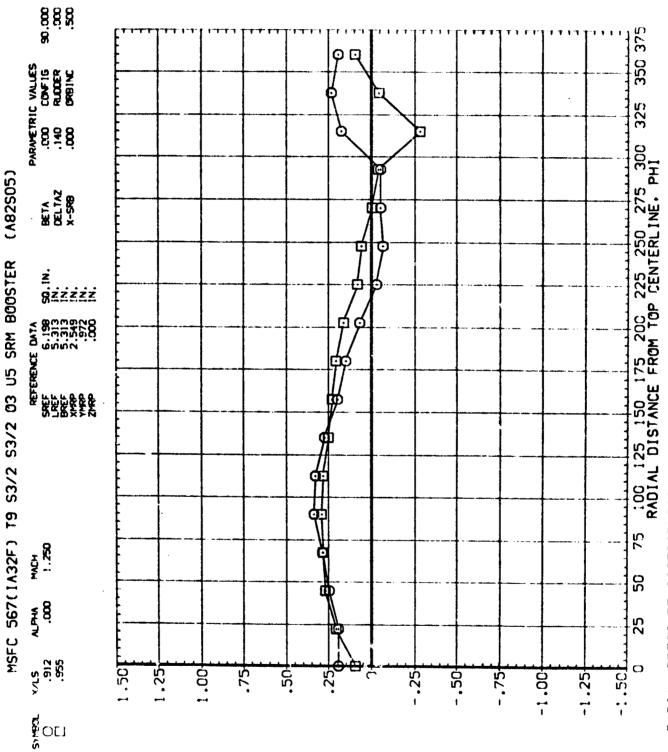


RADIAL PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER

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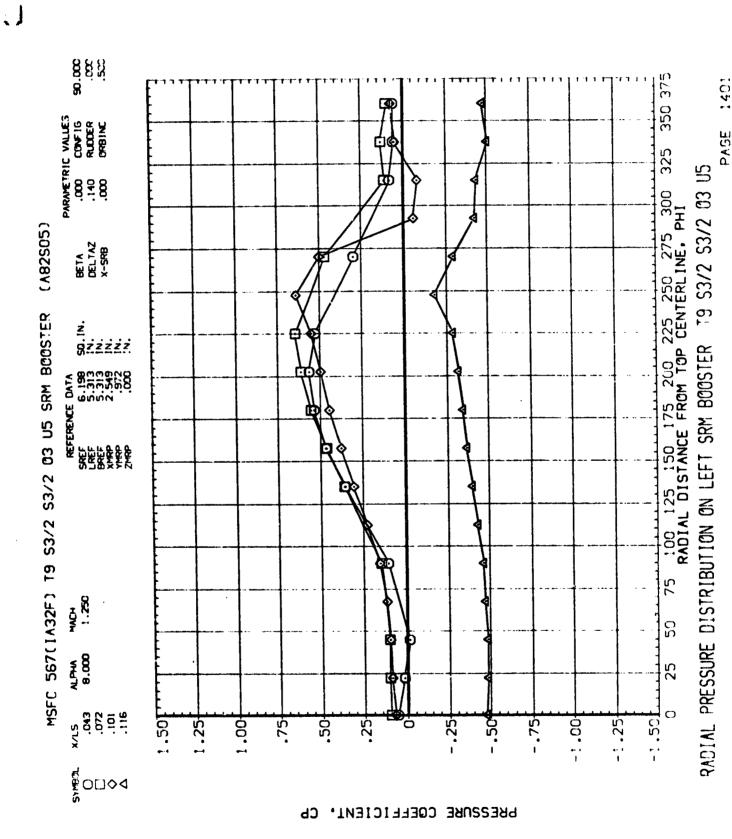


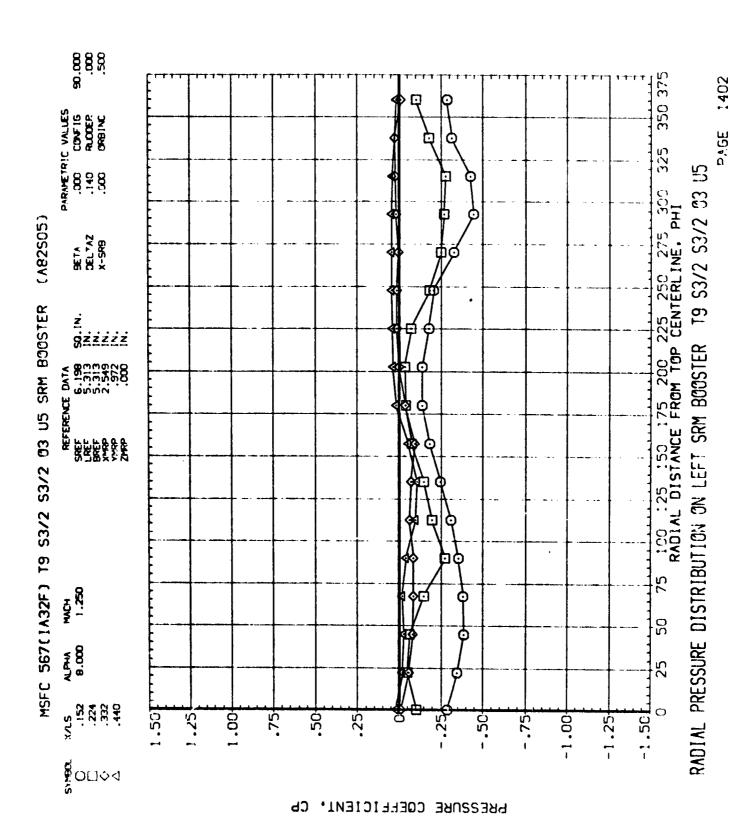




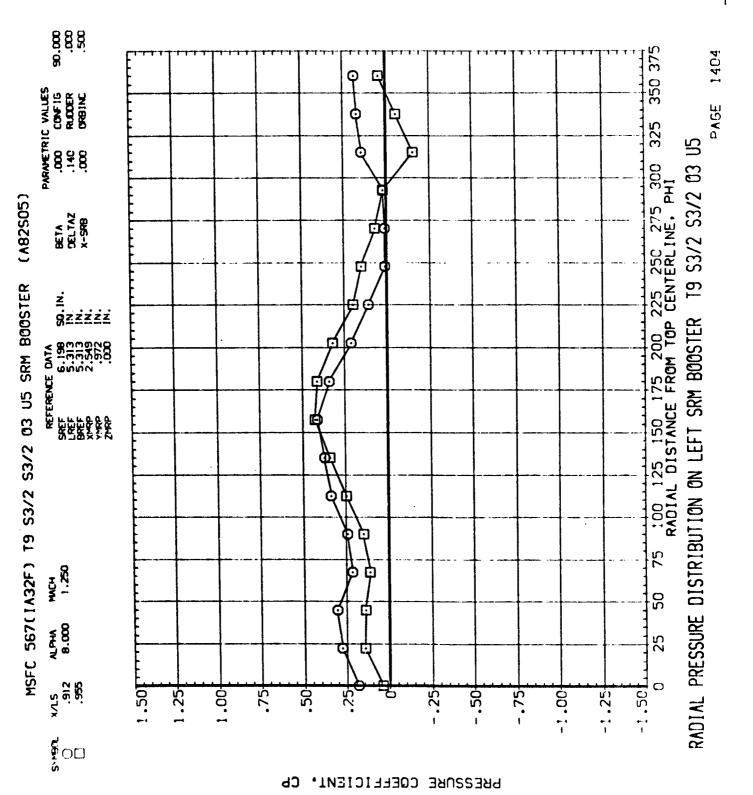
T9 S3/2 S3/2 03 U5 RADIAL PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER

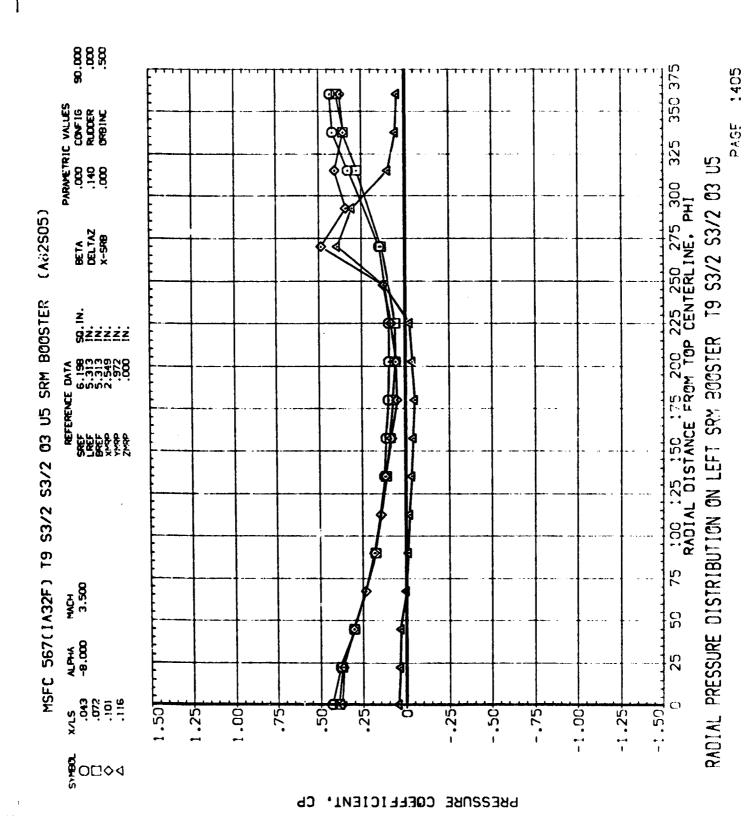
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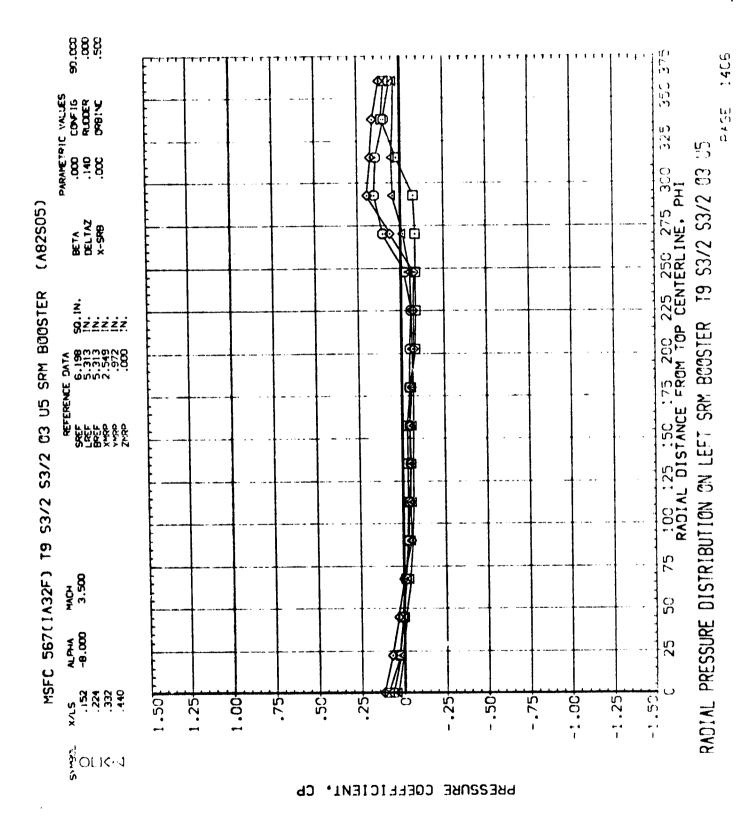


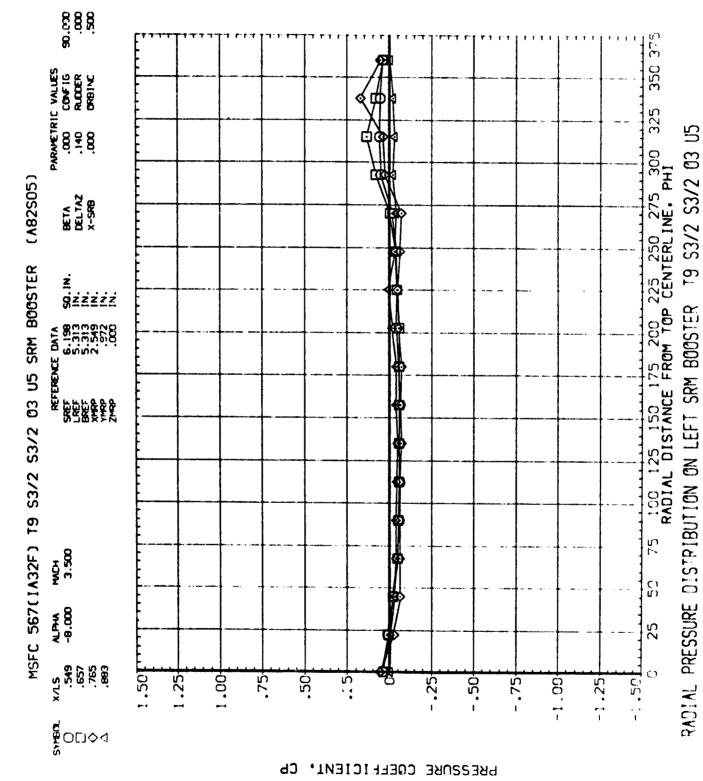


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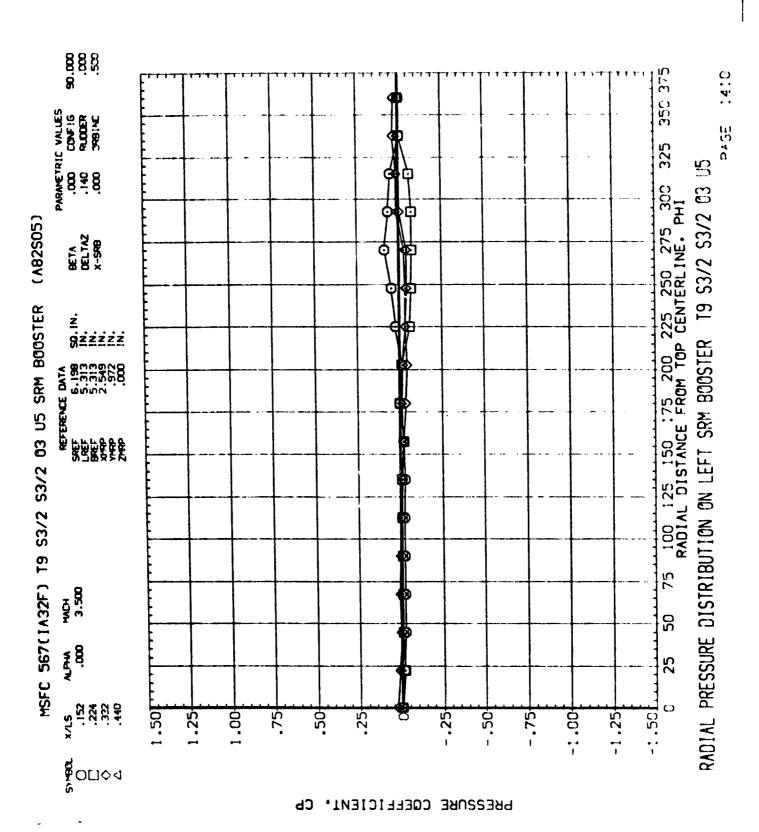


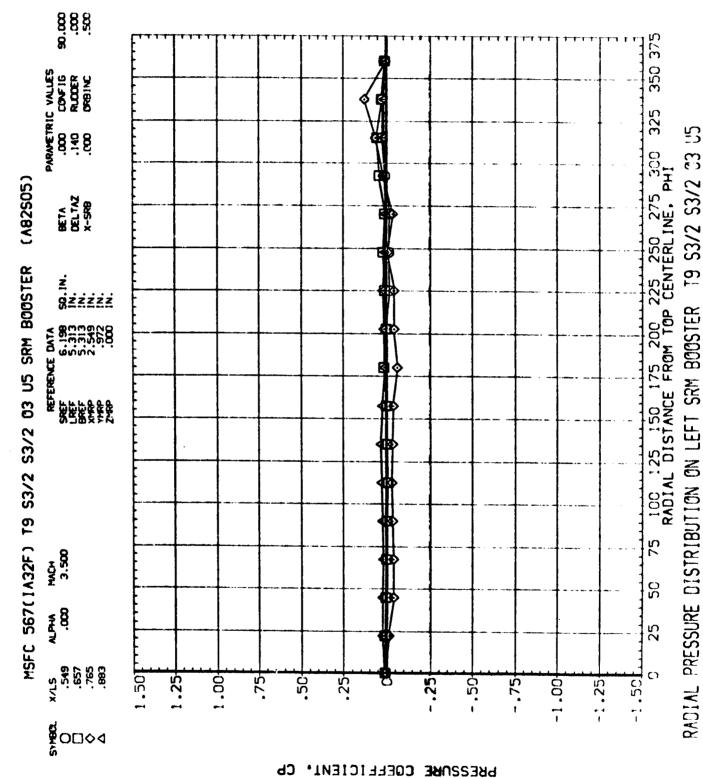




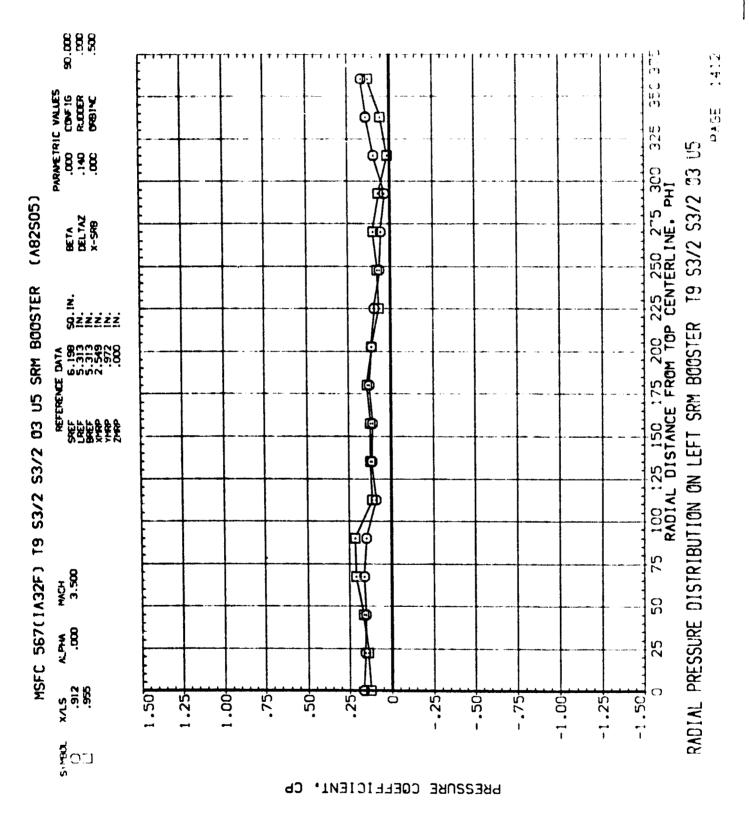


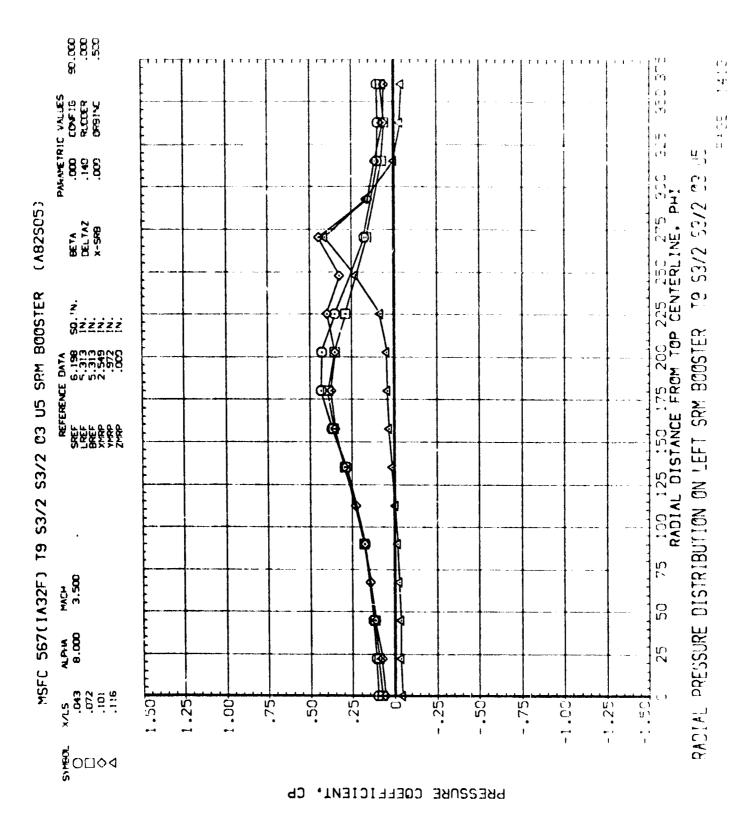
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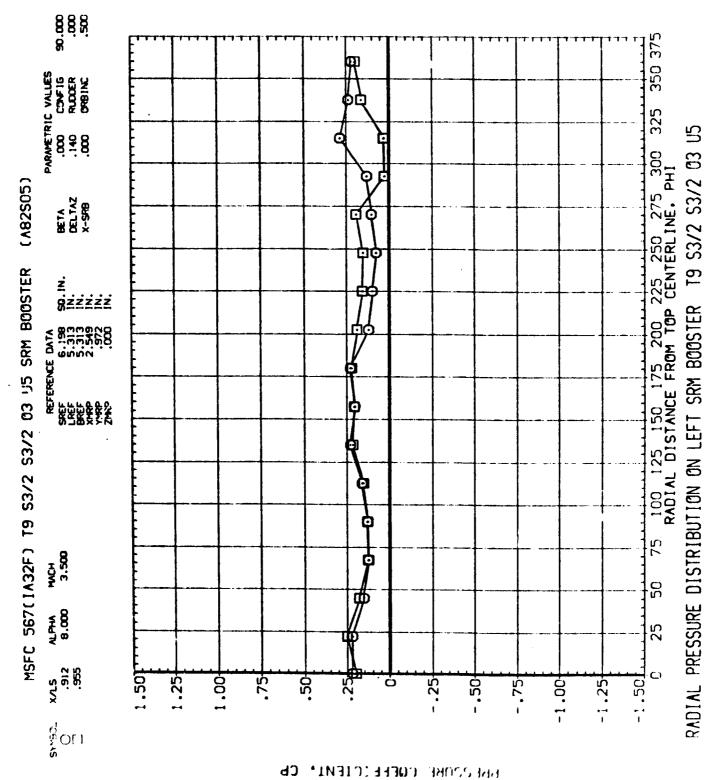
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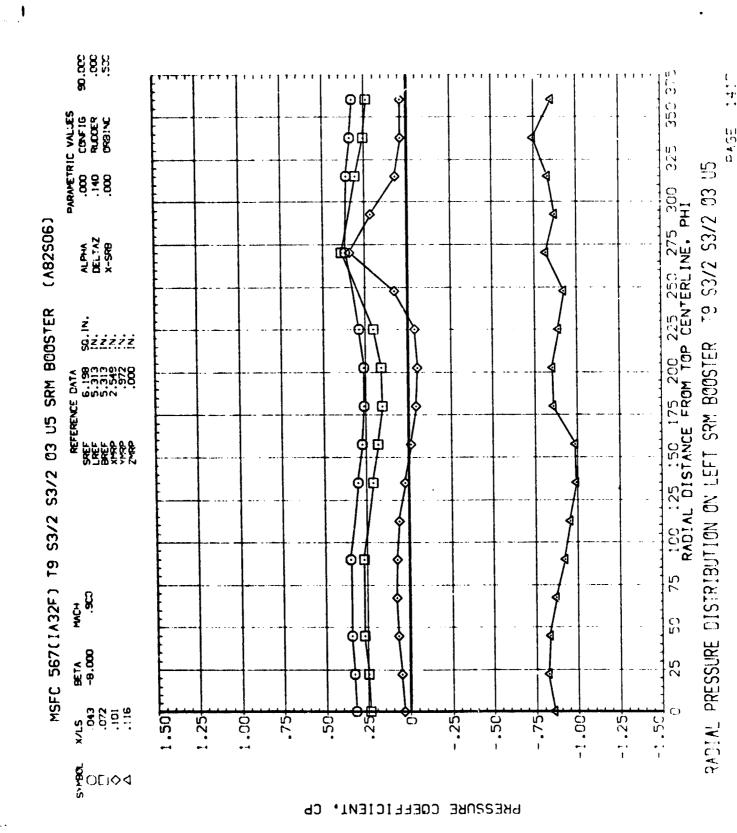




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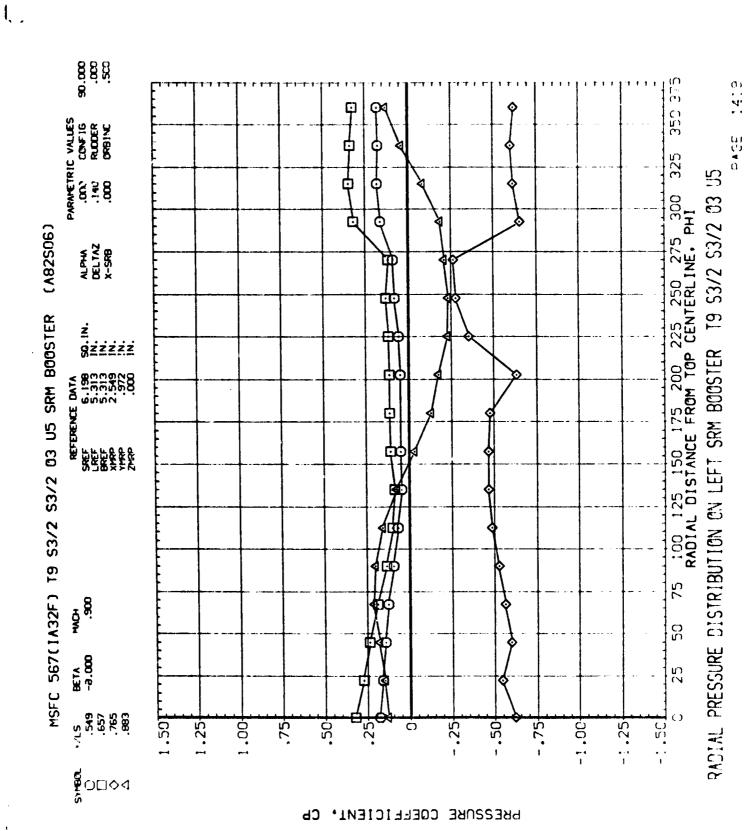
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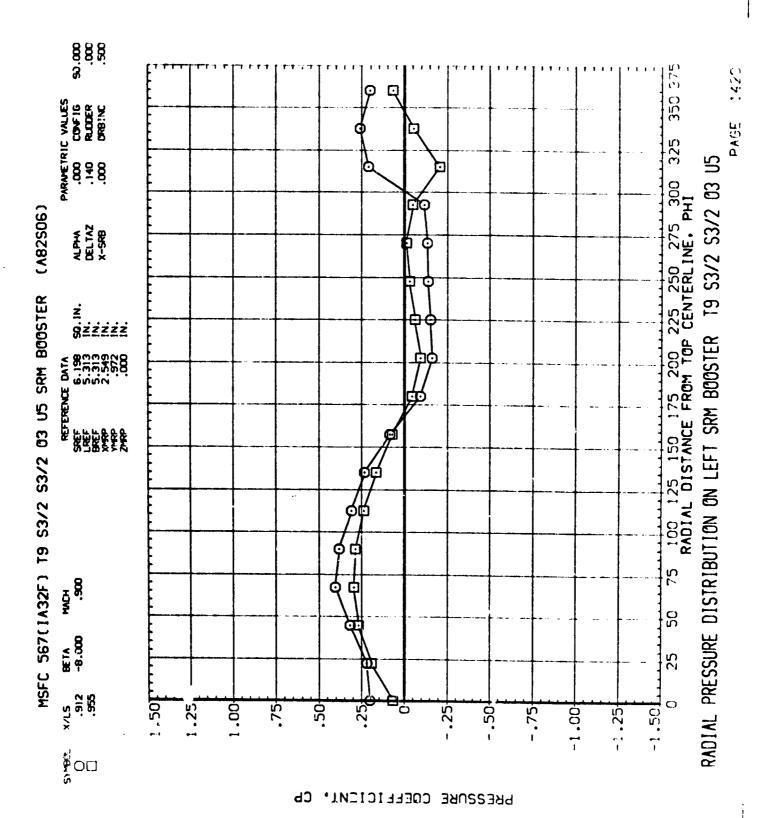
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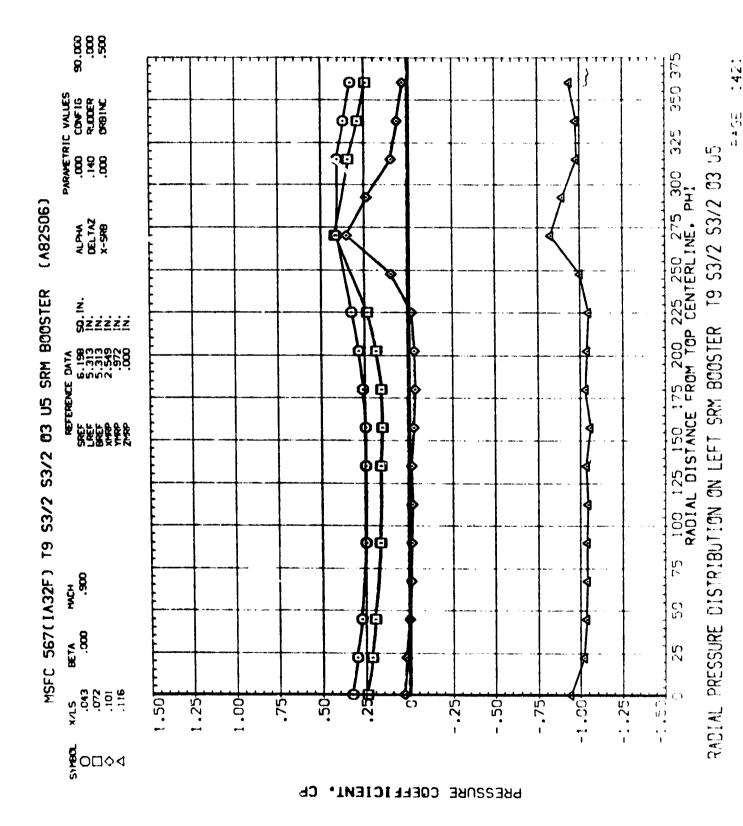
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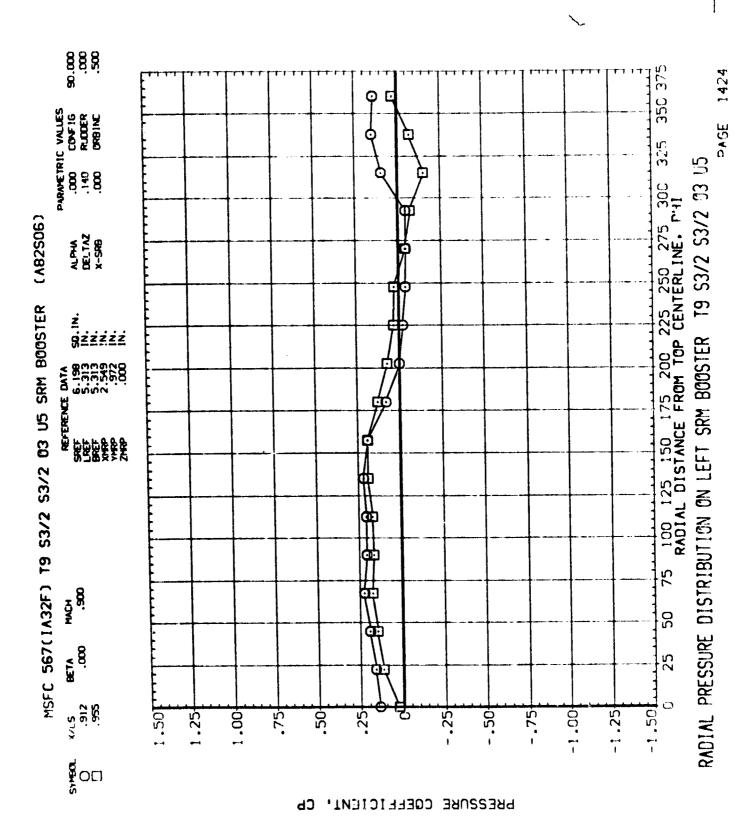
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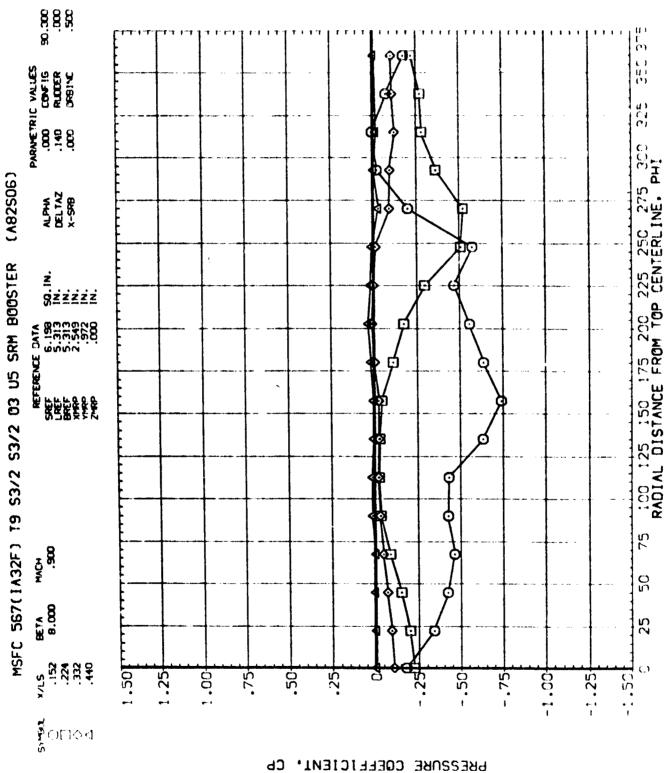
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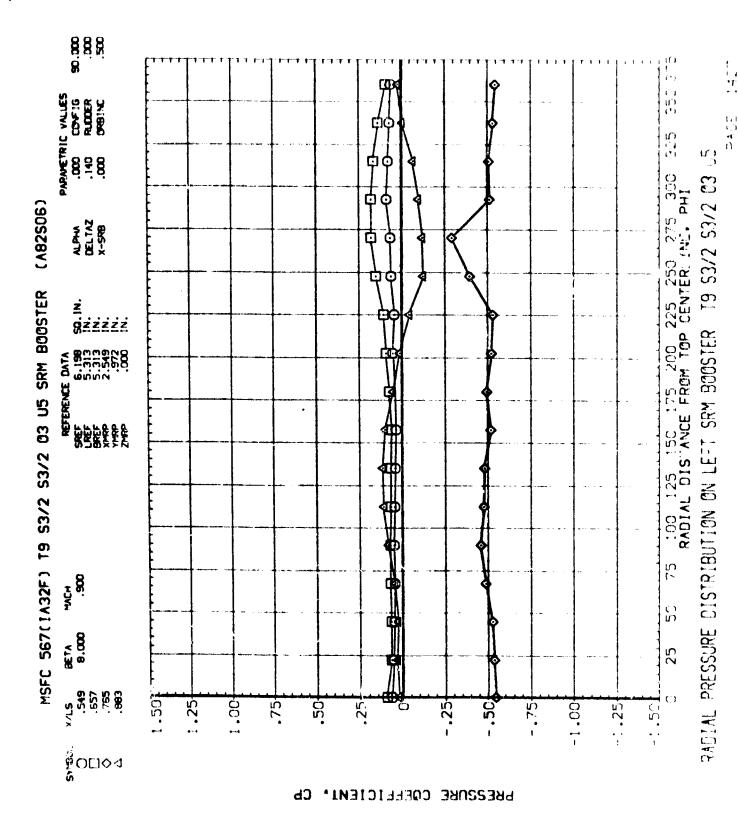


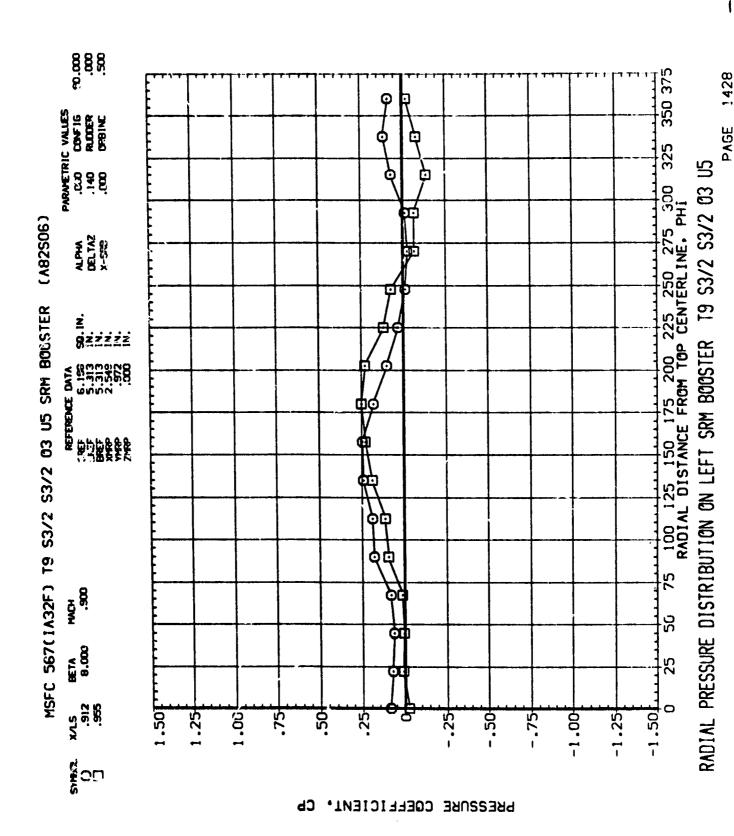
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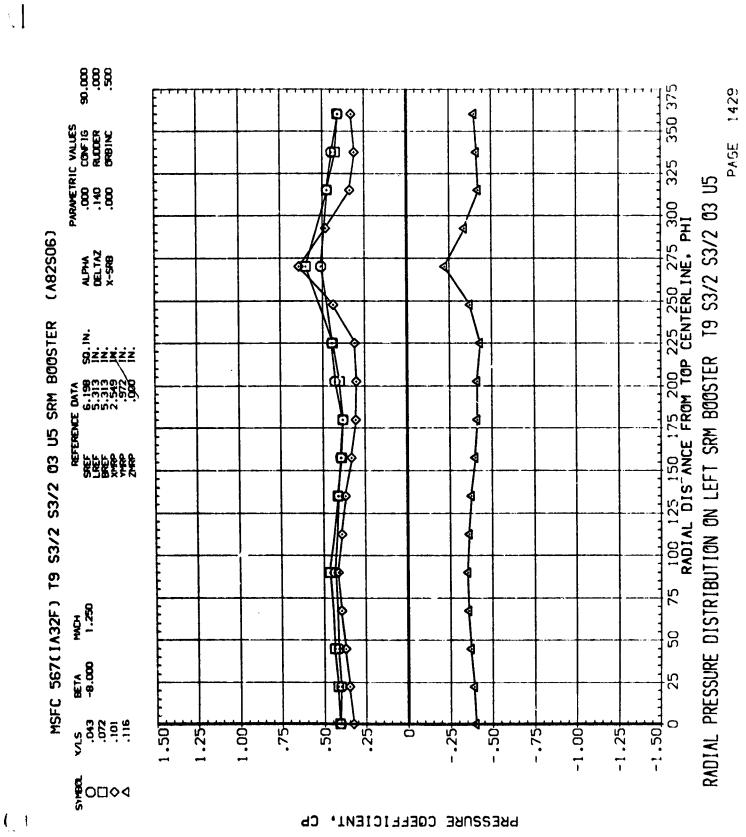
T9 S3/2 S3/2 @3 U5 RADIAL PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER

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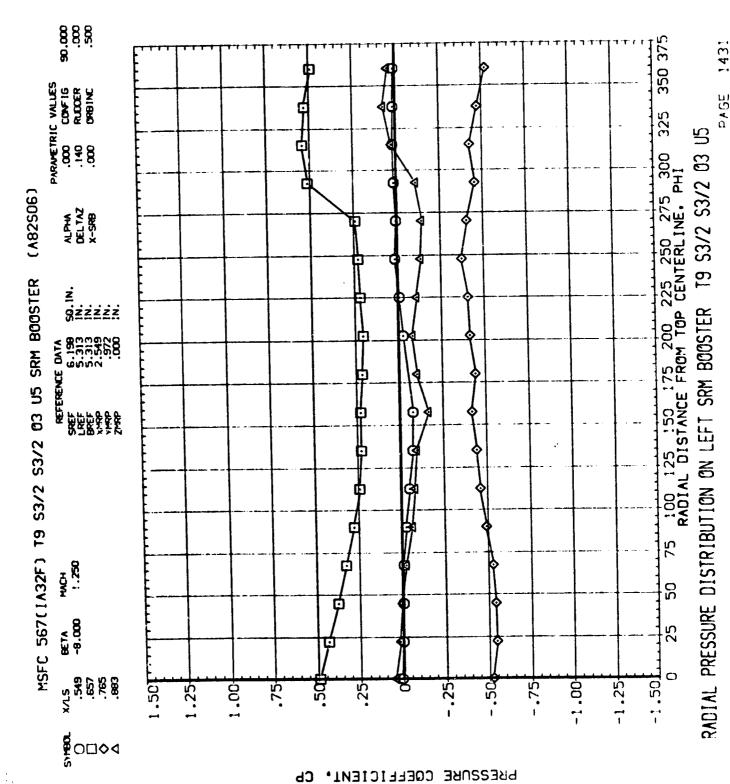


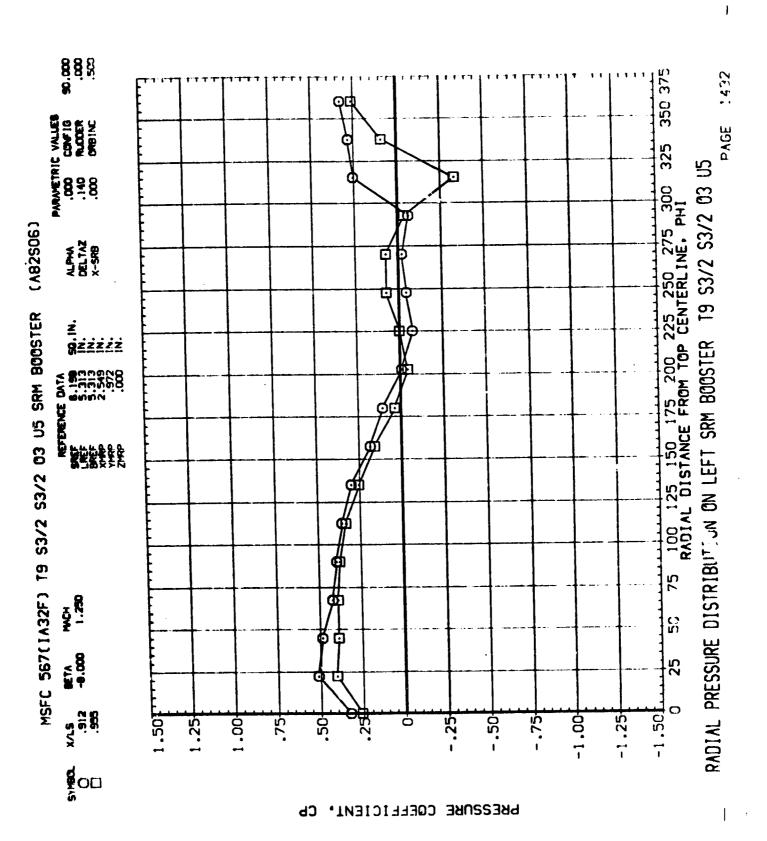


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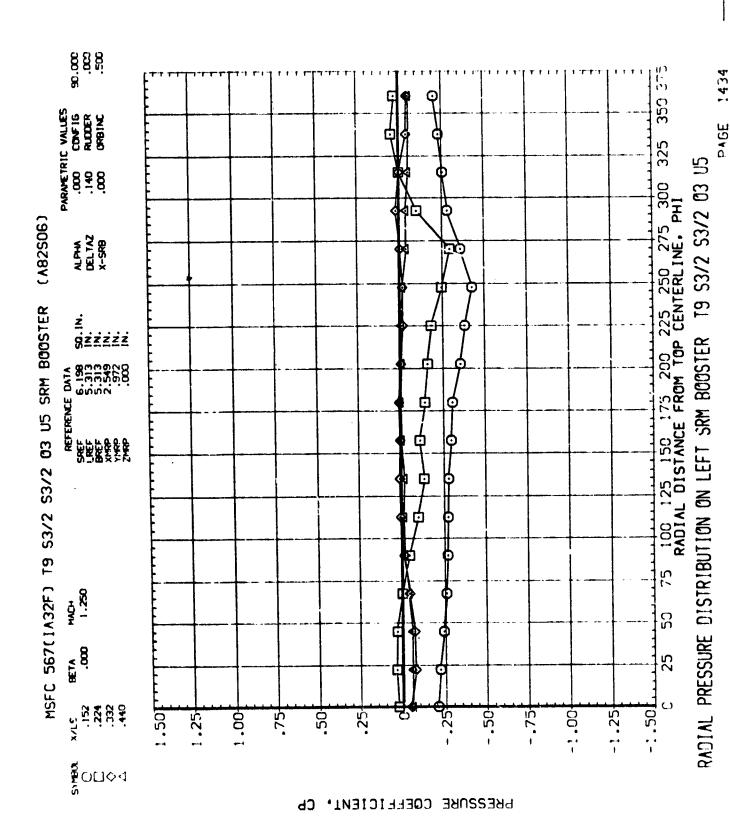
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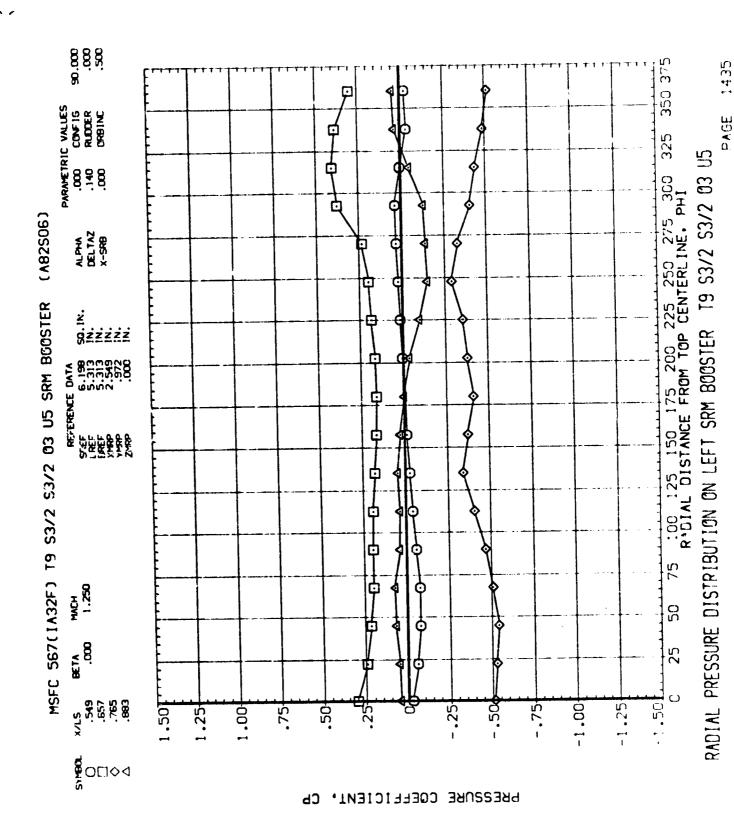


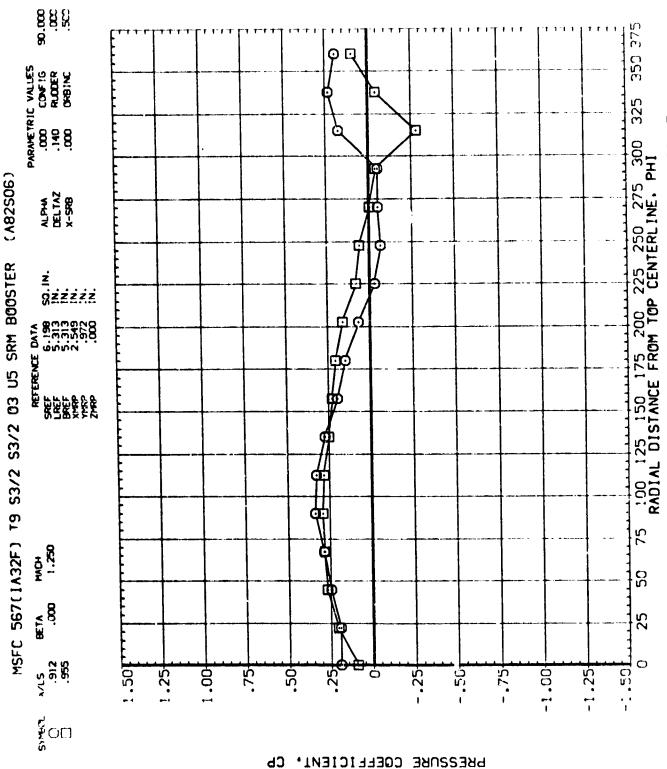


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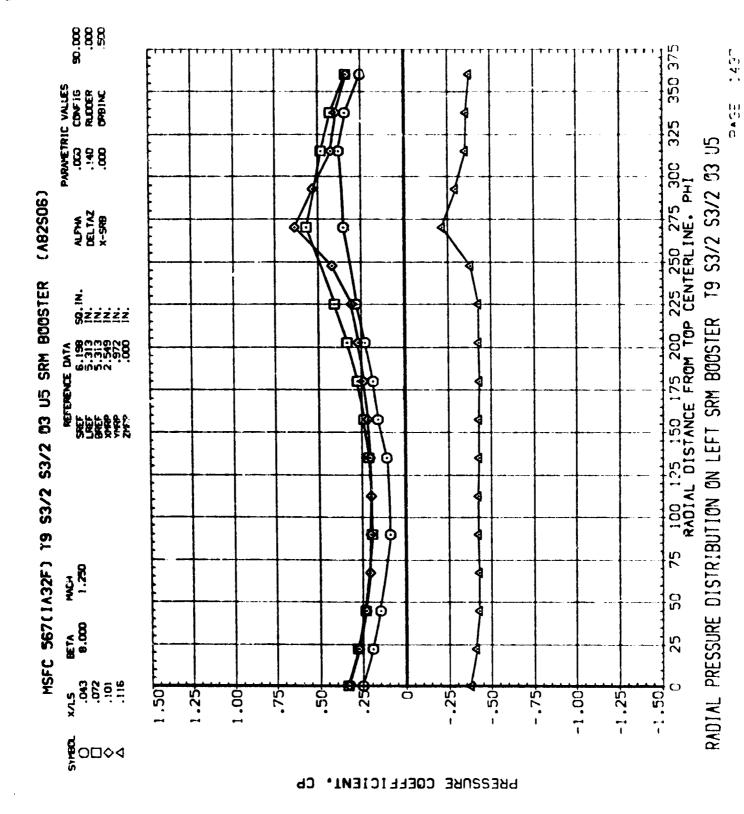






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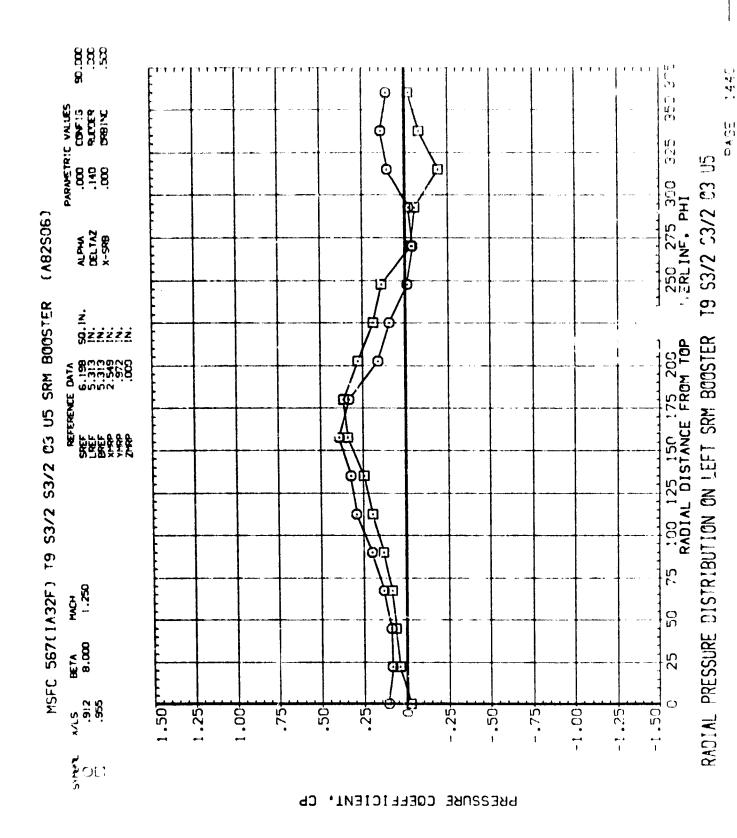
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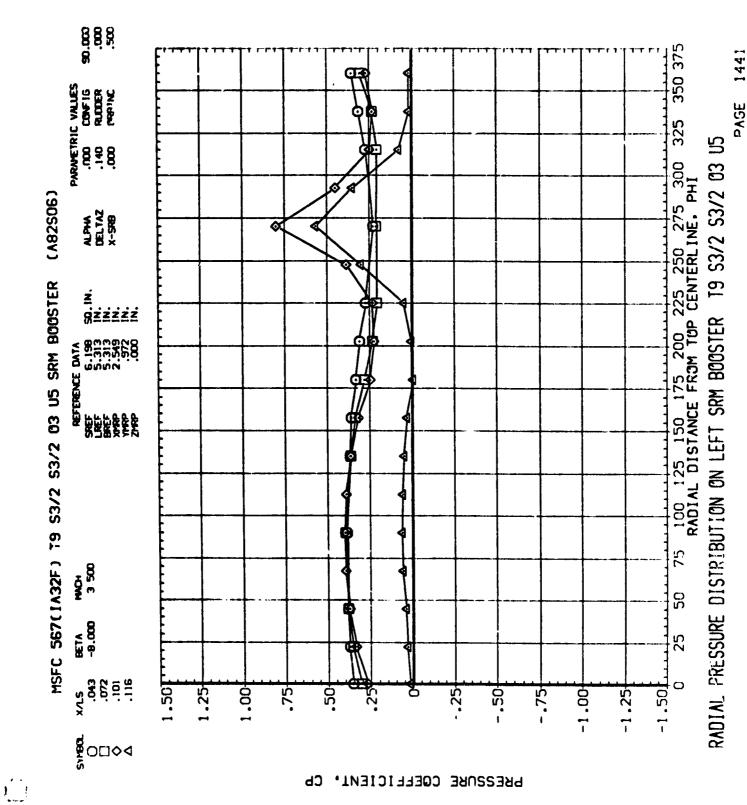
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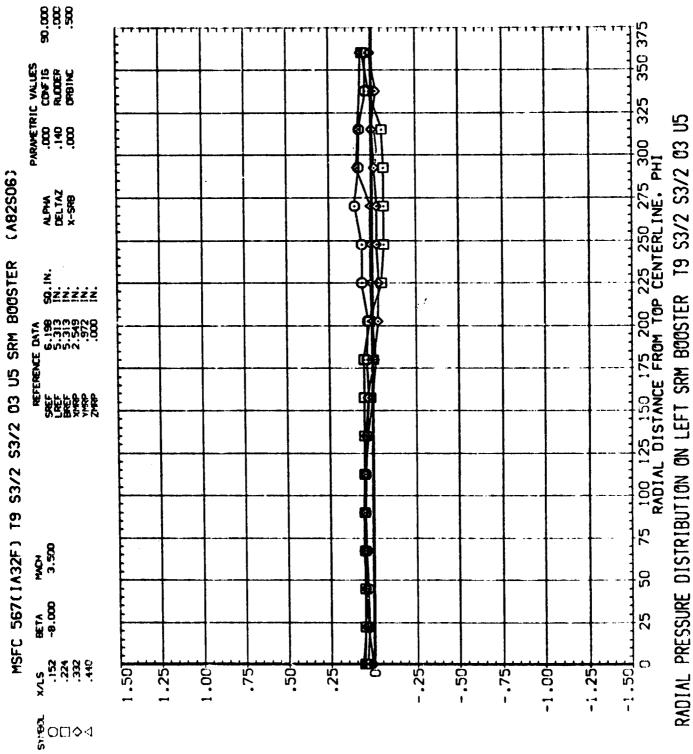
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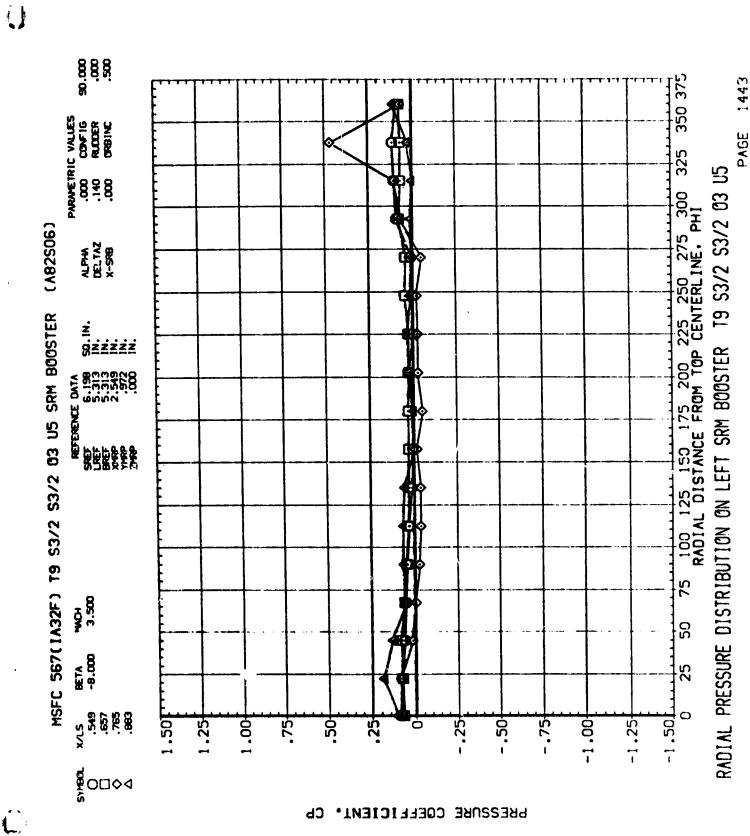
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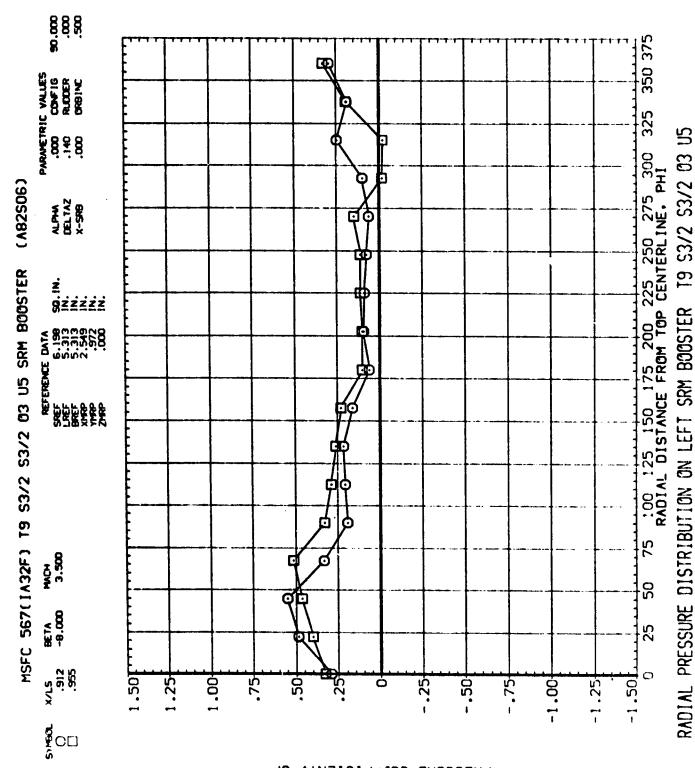






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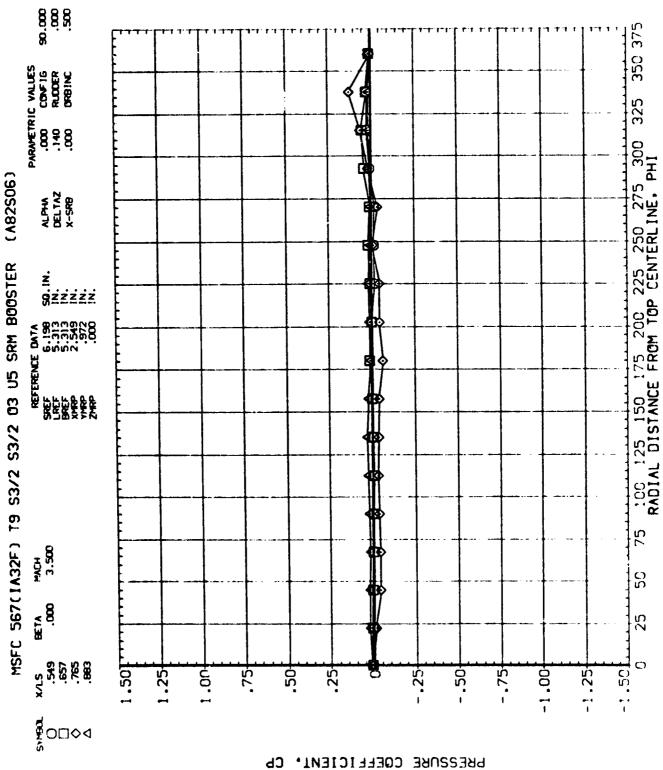
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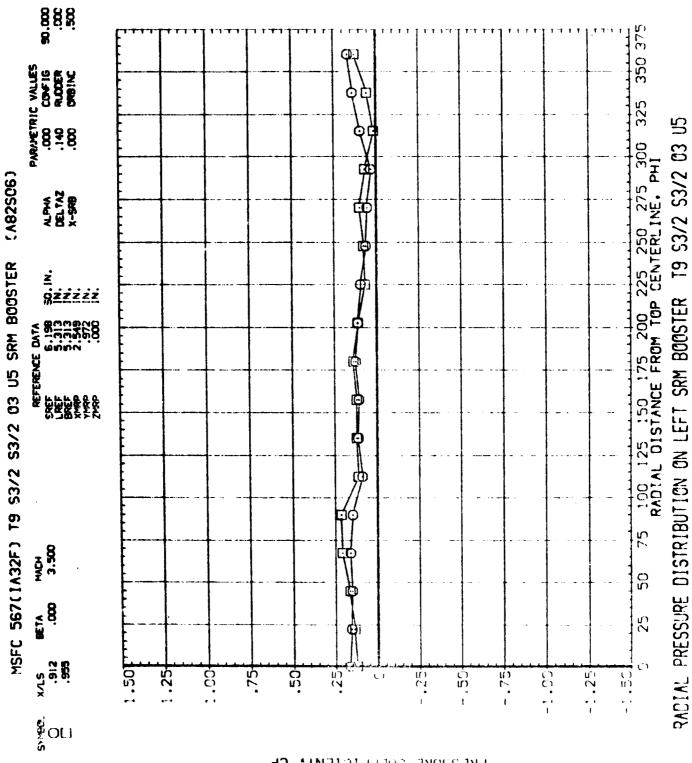
RADIAL PRESSURE DISTRIBUTION ON LEFT SRM BOOSTER 19 53/2 53/2 03 US

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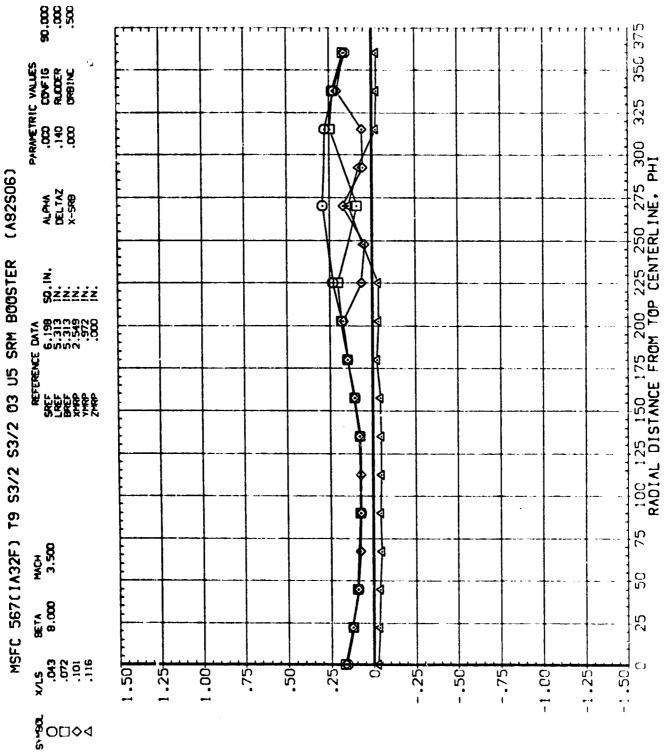


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8. 88. 88. 88. 350 375 PARAPETRIC V. 75 .000 COV .140 RLODER .000 O'89INC :00 :25 :50 :75 200 225 250 275 300 RADIAL DISTANCE FROM TOP CENTERLINE. PHI (A82S06) ALPHA DELTAZ X-SRB MSFC 567(1A32F) 19 53/2 53/2 03 U5 SRM B00STER <u>z</u> g<u>zzzz</u> REFERENCE DATA SREF 6.198 LREF 5.313 BREF 5.313 WHEP 2.549 VHRP 2.549 ZHRP 2.000 75 3.500 S 0 BETA 8.000 25 x/\s .549 .657 .765 .883 1.50F -1.00 .75 .50 .25 -.25 -.50 -1.25 1.25 1.00 -.75 -1.50 \$ 0□\$4

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